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THE NAVAL AVIATION SAFETY REVIEW

Low level flying
is a business...
not a game.

Flying at Ange

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by LT. G.W. Lubbers

Come secure most any Friday afternoon, you'll notice a mass migration of aviators from the flight line to the O-club bar. After a few fast beers to wet a parched throat and several chourses of "Gory Gory" the bedlam soon boils down to aviation chatter. While the fighter pilots are expounding loudly on aerial combat and going through all sorts of contortions with their hands, a group of attack pilots may congregate at a table to exchange sea stories. Invariably, someone will pipe up with, "Let me tell you about this hairy low level."

Being an ex-*Skyhawk* pilot, I got to wondering why low level flying has become catagorized as a dangerous business. I'd always thought of it as a lot of fun, a real ball. There are certain aspects of low level flight which must be learned and practiced but then, there are usually special tasks that must be learned for the successful accomplishment of any mission.

I decided to look through some old low level accident reports to see what, if any, predominent factors were most often involved. A quick trip to the records department for an IBM survey produced some very interesting figures. The survey was limited to accidents, incidents, and flight hazards occurring during low level strike missions or 1
associated weapons delivery. The survey was further narrowed to include only the model aircraft whose primary mission includes a low level capability; namely the A-1 (AD), A-3 (A3D), A-4 (A4D), A-5 (A3J), and AF-1E (FJ-4B). Since mechanical failures can occur at any altitude, most mechanical failures as the primary cause factor were also eliminated from the survey.

During a 40-month period commencing 1 July, 1959 there were 44 accidents, 24 incidents and 138 flight hazards during low level missions. Of the 44 accidents, 39 were strikes and 35 fatalities *or about 1 lost plane and pilot per month!* Several of the

s Decimal Two

24 incidents were initiated by material failure but pilot error in handling the situation was also involved. Eighty percent of the flight hazards were bird strikes which indicates a strong need for FAA to require a flight plan on all bird flights above tree top level. Keep in mind that the accidents do not include pilots and aircraft lost while flathatting or performing other unauthorized low altitude maneuvers. Nor does it include other aircraft performing authorized low altitude work and consequently subject to some of the same hazards.

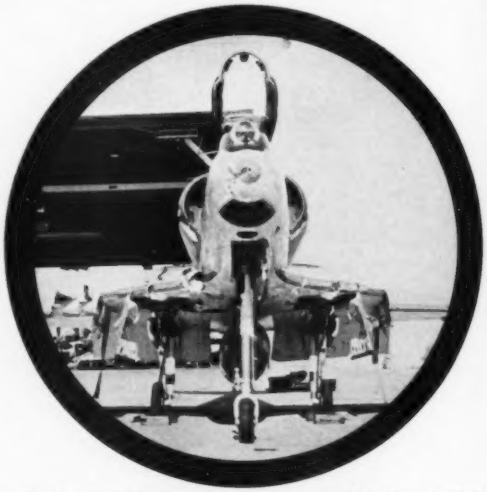
In a majority of the accidents the pilot just wasn't watching where he was going. There have been several cases of encounterment with a Springing Limbiscus tree. This tree grows most anyplace throughout the world and has the ability to take on the characteristics and foliage of other trees in its vicinity. Consequently it is very hard to recognize and avoid. Normal growth of the tree ranges from 50 to 75 feet but it has the uncanny ability to spring a limb or branch as high as 150 feet to snatch at an unwary airman. The only way to avoid this menace is strict adherence to terrain clearance.

Other unwary pilots have run into hillsides, power cables and mastheads. Whatever the object may be, the cause is still, not looking where you're going. The cure isn't as easy as you may expect and certainly entails more than merely keeping your head up and on a swivel, although that is a large part of it.

Several aspects of a good lookout doctrine should be brought out and discussed.

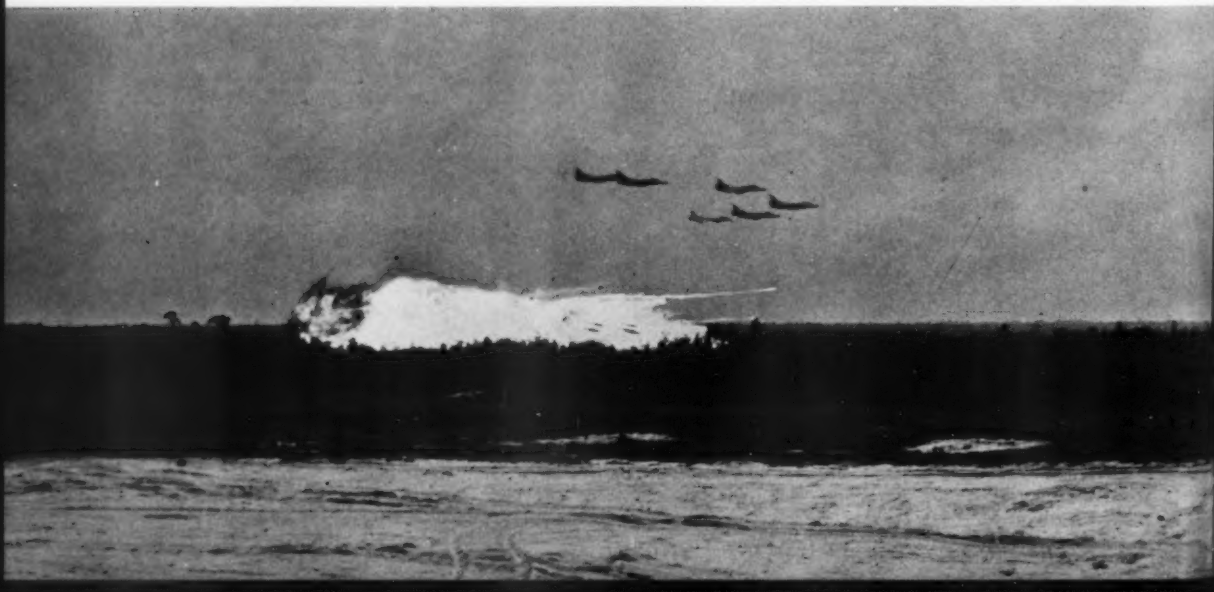
One. Thorough preflight planning. This cannot be overemphasized. It's not enough to draw up a chart and leap into the air; you have to study and know each detail of your route like the back of your hand.

Basic chart reading should be included in every attack squadron's ground training syllabus. There are also several excellent low level training films available when you get tired of lectures. One is of British origin titled: Low Level Pilot Navigation,



This battered SKYHAWK survived a tangle with a Springing Limbiscus tree.

Low level navigation is an indispensable tool of the attack pilot.



Cockpit DISTRACTIONS on SANDBLOWER hops can be fatal.

No. NBJQK8766, another is: Low Level Air Navigation Familiarization, No. NJQACK8917. The use of the three dimensional relief charts can be a big aid in this training and in preplanning your route. Many times significant mountain peaks or some other outstanding terrain feature can get you oriented much quicker than searching for a railroad track or river bridge. Then too, the terrain isn't as apt to change with time the way man made things such as highways and towns, although various seasons give it a different mask.

Speaking of changes, you should become familiar with and use CHUM (Chart Updating Manual). This publication is produced by the Aeronautical Chart and Information Center United States Air Force and comes out once a month. The manual contains all significant chart additions and updating information to unclassified published charts which affect flying safety and have been issued as of the 25th day of the previous month. There is also a classified CHUM for updating classified charts. *For users of low level routes there is a cumulative listing of uncharted obstructions of 200 feet and over in height.*

I haven't space enough nor is it my purpose to go to any great detail on pre-planning. I believe I am safe in saying that far too often this phase of flight is not fully employed and the pilot invariably finds himself slipping farther behind as the flight progresses. Soon, instead of flying from map to terrain the evolution is reversed and the pilot finds himself flying with his head in the cockpit. This, my friends, leads to trouble!

Two. A thorough knowledge of the cockpit is of vital importance. Too many times attention is diverted to locating an instrument or switch. This is more pronounced in squadrons whose aircraft cockpits are not configured the same. There's nothing quite so disconcerting than to reach for a toggle switch and feel a knob. Somehow or other this usually happens at a checkpoint when you just don't seem to have enough hands anyway.

Three. Be thoroughly familiar with the feel of your bird. Contrary to what you have been taught

Know before you go. Don't study your route in the air.

in most instrument courses, you *should* learn to rely on the seat of your pants. The problems of navigating and computing time and fuel changes can become nigh onto impossible if your attention is constantly diverted to your instruments to maintain wing and nose attitudes. The greatest innovation since electric trim has been the autopilot. If you're fortunate enough to have one by all means use it within the flight manual envelope and to the extent authorized by your respective NATOPS. A small tip for consideration. Try at least one A/P disconnect at altitude to be sure it won't disengage with a violent maneuver. This could be disastrous at 200 ft.

Four. Project your attention far enough ahead to allow for reaction and aircraft response time. It's just like driving a car down the highway. The faster you go the farther ahead you have to focus your attention to avoid danger, should it arise. In an aircraft at 300 plus knots (somewhat slower if you happen to be herding a *Super Spad*) this distance is greatly increased. Too often pilots fail to realize the distance covered during the period of recognition, reaction and response. The typical outcome is a crater a few feet short of the crest of a hill.

Altitude control is another vital facet in low level flying. While the vertical flight direction is of little concern in normal operations, it takes on added importance to the sandblower jockey. For him there is only one vertical direction—UP!! The very nature of terrain flying practically eliminates the usefulness of the pressure altimeter. For this reason, most pilots soon become adept at visually estimating or eyeballing their altitude. For those aircraft equipped with a good radio altimeter the problem of maintaining terrain clearance is not too critical; however in the interest of keeping their head out of the cockpit these pilots also come to rely on the eyeball method. Since human judgment is influenced by many variable factors, one pilot's estimate of altitude may vary from another's. One AAR endorser had this to say after a pilot clipped off a bit of North Carolina foliage.

"Lacking a radio altimeter or other low altitude warning device, A-4 (A4D) pilots must judge their terrain clearance. Generally this judgment is acceptably close to the 200 feet minimum and seldom on the low side since the navigation problem becomes rapidly more difficult at lower altitude. *It is probable, however, that a gradual loss of perspective occurs with time in this employment just as an unwary turnpike motorist finds himself at excessive speed without realizing he has changed.* The jet pilot, at a constant airspeed, might well be slowly reducing terrain clearance to retain a given sense of speed.

It has been recommended by several accident

Don't let a mountain peak catch you napping.

Aircraft performance can't always counter late reactions. Think ahead.

FOD and internal structural damage cannot be thoroughly assessed in flight.

boards that when utilized, the chase pilot should periodically check the altitude of the lead plane and advise him when he gets appreciably below the desired altitude.

Along this line, an audio signal, generated into the pilot's earphones and actuated by a radio or radar altimeter, seems to me to be the answer to warning the pilot of his low terrain clearance without the requirement to scan the instrument panel. On many occasions during training and more probably in combat, a chase pilot will not be available to keep you out of the trees. The aural tone presently incorporated in the APG53 radar is useless for this purpose since it is constantly on below 1000 ft. AGL. I believe an audio warning system is presently being developed and/or evaluated in BuWeps. In the interim, a radar altimeter (AN/APN 141) has been procured for the *Skyhawk* and is scheduled for delivery to fleet units beginning this fall.

Another serious pitfall to avoid is poor weather and visibility. All too often, in the interest of completing the mission, a pilot will press on under poor weather and visibility conditions only to end up another statistic in the accident prevention program. A very worthwhile recommendation was made *after* an A-3B (A3D-2) and crew planted themselves into the side of a jungle hill.

"Minimum enroute altitudes must be predetermined for each leg of Sandblower Routes. Flight crew personnel must be indoctrinated to observe those altitudes and to reverse course or climb if it is apparent that VFR conditions cannot be maintained."

Couple this recommendation with the proficient use of the terrain clearance radar installed in most of our attack aircraft and we should be well on the way toward eliminating this hazard. Incidentally, the search mode of this radar can be used quite effectively to keep you out of the thick of the storms.

Another pilot, quite willing to steer clear of the weather, failed to take into account the extra fuel used and flamed out 20 miles short of home field. This was an unnecessary loss because his flight path took him close to several adequate divert fields.

This brings up another point which was rather evident in reading numerous accident and incident reports. All too often pilots are nursing a sick or torn bird hundreds of miles to home field rather than setting down at a nearby suitable alternate. As long as the engine is running

smoothly, a few more minutes in the air is perhaps a small risk to take if a landing can be made at a familiar field where adequate equipment and ground crews, familiar with the aircraft, can be of greater assistance. But this should be weighed against the possibilities of FOD and internal structural damage which cannot be readily assessed in flight. By all means, if doubt exists slow flight the aircraft at altitude in the landing configuration (most sources recommend above 5000 feet) and then take it into the nearest field. Besides, "Divert" stories make just as good or better tales at Happy Hour.

As the Navy's attack aircraft develop longer and longer legs the problems of pilot comfort and fatigue are taking on added importance. This problem is old hat to most A-1 (AD) drivers and since the utilization of inflight refueling, has become more noticeable to the light jet pilot with his cramped quarters and not too reliable air-conditioner. Believe me, four hours bouncing along in a Tinker Toy can get mighty tiring and gives you a good case of TB. It's not something I'd care to do after a big night on the town.

A big part of the solution to the fatigue problem is physical and mental fitness. This is one reason why the flight surgeon harps on overweight and overindulgence. You can't booze it up with the fighter pilots every night and expect to be on your toes when you're clipping along the tree tops. You don't need a gymnasium full of equipment to keep in shape either. If you use the contraction or dynamic tension method you can keep those little used muscles toned up while you're shooting the bull in the readyroom. Aircraft designers are also aware of this problem and are constantly striving to improve cockpit design.

This brings me to the last topic of discussion—*Overconfidence*. Certainly confidence is a necessary trait, without which, no amount of training and experience can yield an intrepid aggressive naval aviator. And yet, there is a fine line between confidence and overconfidence beyond which, an aviator may tend to become careless or reckless. Overconfidence, while not a prevalent attitude among most newcomers to the low level game, tends to develop after the basic techniques of low level flying have been learned. If this trait or attitude is allowed to continue, situations may occur of which the outcome could be disastrous. An A-4 (A4D) pilot found this to be all too true.

While chasing another pilot on a low level navigation flight this pilot allowed himself to become overly distracted inside the cockpit (daydreaming) and commenced a gradual descent toward the trees. As the pilot again looked up he realized a collision was imminent and applied back stick pressure. Fortunately the aircraft only brushed the tops of the trees. The unfortunate part about it was that the pilot did not declare himself in an emergency situation and after inspecting the aircraft through his mirrors, continued to home field and made a normal landing. The first time anyone on the ground knew of the accident was when the aircraft returned to the line.

The accident board stated: "Pilots should be cautioned against allowing themselves to become complacent through having considerable experience in low level flying. The same hazards encountered on the first low level training flight are still present."

The skipper also had a few choice comments to make in his endorsement to the AAR. Among them was this statement. "Overconfidence. This was definitely a very large factor. The weather was balmy, the route a familiar one, and everything was going fine. The new pilot was following the planned route satisfactorily and everything in the plane was functioning normally. I imagine that his subconscious thoughts went something like this: OOPS, how did I get down here, must have brushed the very soft top of that tree, can't see anything in the mirrors, everything seems okay. I won't say anything about this and maybe the plane captain can wash the chlorophyl off and no one will ever know. That's overconfidence! That is being a damn fool!"

In conclusion let me sum up with a few points which can be your guide to a most enjoyable type of flying.

- Thoroughly preplan every flight. Without it you're doing little more than flathatting.
- Become thoroughly familiar with and confident in the bird you fly.
- Always remain alert to the situation and your surroundings. Never allow yourself to slip into complacency.
- At the slightest indication that all is not well, *climb*.

Follow these guidelines and you too can be among those gathered around the table at the next Happy Hour.

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An Inch From Eternity

From time to time an interesting or unusual aircraft incident crosses the desk. This is one of the rare type incidents aboard carriers; however, it is of sufficient importance to emphasize the continual need for naval aviators to be ready to meet any and every emergency.

The right brake failed after a normal arrestment. The nose wheel castered and the aircraft rolled forward parallel to the waist catapult. Apparently the starboard brake hose had slipped on the strap assembly which allowed the brake line to either hang up on gear extension or caused the catapult bridle to hit the line. The line was crushed which rendered the right brake inoperative. This occurance initiated a rapid series of events which, except for a fast acting deck hand and an extreme amount of luck, could easily have resulted in the loss of an aircraft and possibly a pilot.

The squadron recommended several actions that could have been taken which might possibly have prevented this aircraft from reaching that perilous resting place. These include: securing the engine; lock the left brake (*although this may have sent the aircraft into the port catwalk–Ed.*); or raise the landing gear.

Of more concern are the actions actually taken by the pilot. Realizing that the aircraft was apparently going over the side, the pilot opened the canopy, unstrapped from the seat and was planning to jump. Even had he been lucky enough to abandon the aircraft before it left the deck, the chances are pretty good he would have been struck, run over, or possibly dragged over the side. Although the aircraft was moving very slowly toward the end of the angle, this squadron considered an ejection preferable to riding the aircraft into the water. *This action would have been impossible once the canopy was opened.*

The following recommendations were made by the squadron concerning this type incident:

- That all aviators faced with the possible loss of brakes aboard a carrier be thoroughly indoctrinated in the most likely means of keeping their aircraft on deck.
- That the hazard of unstrapping prior to entering the water in an aircraft be more forcefully brought to all pilots' attention. (*As an added comment to this recommendation, the hazard of slipping over the side is always present whenever the aircraft is not chocked and properly tied down. It's just good headwork to stay strapped in until the aircraft has been adequately secured–Ed.*)
- That more emphasis be placed on the use of the ejection seat as the primary method of abandoning an aircraft that is going to enter the water. (*This recommendation is highly controversial and should make a good ready room discussion topic. –Ed.*)

There is only one conclusion to this incident. This pilot was just plain lucky!! He was slightly pale from his harrowing experience but well. ●

Well done to an alert crewman who threw a chock at the wheel and possibly averted the loss of a pilot and aircraft.

The aircraft came to rest when the nose strut jack pad caught in the drain gutter that surrounds the carrier.

APC: REMEDY for Airspeed HEADACHES

The Approach Power Compensator or "autothrottle" has enjoyed considerable advance publicity, a great deal of which is warranted, but may disappoint those who are expecting it to perform miracles. When used properly the APC will maintain angle of attack and airspeed at optimum values during the landing approach but — it will not land the airplane for you.

A DEVICE known as the Approach Power Compensator (APC), commonly referred to as the "autothrottle," is now being introduced to the fleet in F-8 (F8U) airplanes and in a limited number of F-4s (F4Hs).

Installations in other types are scheduled in the near future and will be similar to the *Crusader* version discussed in this article. Fleet pilot knowledge of the capabilities and limitations of the device can result in a significant increase in the safety and effectiveness of carrier operations in modern high performance airplanes.

It must be emphasized that the autothrottle will *not* land the airplane for you. The autothrottle *is an assist* for you as a pilot during the carrier approach. Should you fail to keep the "meatball" centered and the airplane lined up on the centerline, nothing in the autothrottle system will do it for you. In fact, if you accept a low approach and fail to correct, we guarantee that the autothrottle will insure that you hit the ramp on speed.

Concept

The concept of an automatic speed control device as an aid to the pilot during the landing approach is not new.

In the past there have been many proposals for such an aid. Some never got past the concept stage, others failed to become actual hardware, while a few actually reached the flight test stage.

Early tests of the fully automatic carrier landing system in 1957 witnessed the installation and evaluation of an automatic speed controlling device in the venerable *Skynight*. Still later, a *Cougar* was equipped with an automatic throttle and successful carrier landings were effected. At that time it was placed in the category of a luxury and not considered necessary.

In 1960 it was installed on an F-8 (F8U) after fleet experience had revealed that help was needed for the *Crusader* pilot in the carrier approach. This system and two others were subsequently tested before a production system was finally ordered in 1962.

by LCDR R.K. Billings and LCDR N. Castruccio

Questions?

Let's answer such typical pilot questions as:

How does it work?

How do I use it?

What can I expect it to do for me?

What happens when it fails?

What is the best way for me to become familiar with its operations, its capabilities and its limitations?

How much added maintenance will it require to keep it operational?

Basically, the device senses the airplane's angle of attack and vertical acceleration, and by means of a transistorized electronic computer sends a signal to the throttle servo to vary thrust as required to maintain the desired angle of attack.

If the pilot increases the airplane's angle of attack, for example, by rolling into a level turn from straight and level flight, the computer will advance the throttle to increase the airplane's airspeed the required amount in order to reestablish the desired angle of attack. Conversely, if the airplane's angle of attack is reduced, the computer will retard the throttle, as necessary, to reestablish the desired angle of attack.

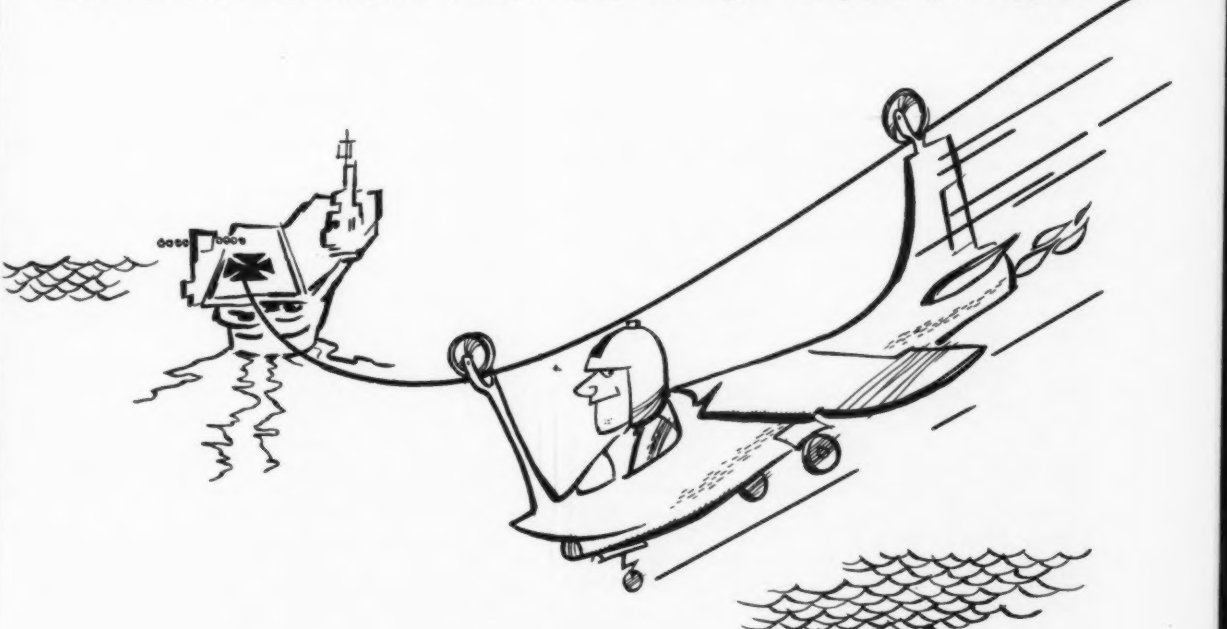
The amount of thrust variation (throttle movement) for a given angle of attack change is based on the drag versus angle of attack curve *in the landing configuration* for the particular model airplane on a standard day at sea level.

Incorporated in the computer is an error correction circuit, which operates continually. By means of this circuit, differences in individual engines, airplanes, airplane weight and atmospheric conditions which vary from a standard day are automatically compensated for. To make the job of this correction circuit a little easier, a three-position Temp switch is provided in the cockpit so that the pilot can adjust for large variations in free air temperature.

The system features include an aft throttle limit, throttle override disengagement, and automatic disengagement at touchdown.

The purpose of the aft throttle limit is to preclude the reduction of engine RPM to a value below which the prudent carrier pilot has generally set as his minimum because of the engine's acceleration characteristics. Depending on the particular engine model, the aft throttle limit is in the neighborhood of 77% engine RPM.

The throttle override feature permits the pilot to disengage the system by the applica-



tion of approximately 20 pounds of force at the throttle lever for a few degrees of throttle movement either fore or aft. This may sound complicated, but it's just a rap on the throttle and you've got it.

At touchdown, the main gear struts will compress and allow the landing gear microswitch to open. This action breaks the circuit and automatically disengages the system.

Pilot Operation

The system is straight forward and will require a few changes to present standard operating procedures. During pilot preflight inspection, the only item of the autothrottle system for him to visually check is the angle of attack sensor for freedom of operation. This really represents no change from previous preflight inspections.

A thorough ground check may be performed with external power since all components are electrically operated. The following procedures can be quickly performed and will result in a complete system check out. They are normally conducted by the ground crew, but recommended for pilots during initial familiarization:

- Engine Master OFF.
- With the throttle friction set at MINIMUM, move the throttle around the horn and 2/3 of the way between IDLE and MRT.
- Temp switch in any position.
- Hold angle of attack vane at 13 units (12 units for RF-8A).
- Engage autothrottle by holding Engage switch ON. No system warmup is needed. Throttle may initially move, but should stabilize at a fixed position.
- Increase angle of attack one unit. The throttle will move forward to MRT since a constant angle of attack error persists.
- Decrease angle of attack one unit or more. Throttle will move back to aft stop, which is about one inch forward of IDLE.
- Release Engage switch. Switch should move to OFF indicating disengagement due to landing gear microswitch.
- Have the plane captain override the landing gear microswitch in the LH wheel well and then engage the autothrottle at 13 units. The Engage switch should stay ON without being held. Overpower the throttle in the forward direction, noting the force required and autothrottle disengagement. Reengage and repeat the overpower in the aft direction.

The pilot must firmly implant in his mind the necessity to insure that *the throttle friction control is set at the minimum position* for autothrottle operations. Failure to do this will result in sluggish throttle response or no throttle response to changes in the airplane's angle of attack as a result of the activation of the manual override feature.

It is strongly recommended that the pilot monitor the operation of the autothrottle at all times, by lightly resting his left hand on the throttle lever. Not only will this permit the pilot to detect immediate failure of the system, but it will also permit the pilot to override the system with a minimum of delay, should the occasion for such action arise.

Depending on squadron doctrine, the system may be engaged anytime after the airplane his been placed in the landing configuration by activating the Engage switch to ON and setting the Temp switch previously mentioned. Setting the Temp switch, however, is critical only under extreme conditions. It is recommended that these procedures be accomplished immediately after the airplane is in the landing configuration, in order that the pilot may be free of the requirements to continuously monitor angle of attack/airspeed. Thus, he can devote his attention to the problems of effecting a satisfactory instrument approach or to line-up and meatball as the situation dictates.

Once the system has been engaged, the pilot need only coordinate stick and rudder inputs to position the airplane on the proper approach track glide path. The system will maintain the angle of attack/airspeed at the desired value, unless the capabilities of the autothrottle are exceeded because of radical maneuvers.

However, the system is incapable of maintaining the desired angle of attack/airspeed when:

- The angle of bank and the rate of climb or descent is such that the thrust required to maintain the desired angle of attack/airspeed exceeds that available at MRT.
- The rate of climb is such that the thrust required to maintain the desired angle of attack/airspeed exceeds that available at MRT.
- The rate of descent is such that the thrust required to maintain the desired angle of attack/airspeed is less than that obtainable due to the aft throttle limit.

In the first two situations, the airspeed will be less and the angle of attack greater than desired, requiring the pilot to reduce bank angle and/or rate of climb. If the situation dictates, the pilot can manually override the autothrottle and select CRT. In the third sit-

uation, the airspeed will be greater and the angle of attack less than desired, requiring the pilot to reduce the rate of descent. Should the pilot not desire to reduce the rate of descent, he can manually override the system and reduce the throttle to the idle detent. The pilot can always disengage the autothrottle by placing the Engage switch OFF, but in situations requiring immediate action, it is recommended that the pilot manually override the throttle.

Pilot Familiarization Flights

Pilot familiarization with the operation and characteristics of the system, prior to actual use in the landing pattern, will at most, require about 15 to 20 minutes of slow flight at altitude. In actual experience some fleet pilots, after a thorough briefing, entered the touch-and-go landing pattern immediately after take-off and commenced autothrottle approaches and landings. However, where time permits it is recommended *that pilots be permitted to feel the system* out at altitude, away from the distractions of the traffic pattern.

The following is a suggested procedure for initial autothrottle check-out:

1. Airplane weight should be in the vicinity of the maximum landing weight, although the system will operate satisfactorily at any airplane weight.

2. At a safe altitude (2000-5000 feet) with the airplane in the landing configuration and while in straight and level flight at the normal approach angle of attack, engage the autothrottle. (*Caution* — Insure that the throttle friction control is set at the minimum position.)

3. Practice level turns and note throttle response during entry into the turn and return to straight and level flight. The pilot should note that the throttle is seldom at rest and that application of throttle upon initial roll-in is sooner than the normal pilot technique and generally of a greater magnitude than used by the pilot. The reason for the larger throttle movement is that the system maintains the desired approach angle of attack at all times. Generally, most pilots allow the angle of attack to increase a half unit during the turn, such that the approach indexer displays a doughnut and a SLOW chevron. With the autothrottle you should see a doughnut on the indexer at all times except during radical maneuvers.

During return to straight and level flight the system will reduce throttle sooner and be of a larger magnitude than the pilot is normally accustomed to doing. The almost constant movement of the throttle and resultant thrust variations, especially in turbulent air, will be annoying to the pilot at first, but within a short period of time most pilots will quickly adjust to this peculiarity of the system. A comforting thought though, is that when the throttle is moving, you know the system is operating. With practice the frequency and magnitude of throttle movement can be reduced by smooth and judicious stick inputs on the part of the pilot.

It is important here to point out that angle of attack and airspeed may vary as much as ±1 unit and ±6 knots depending on turbulence and technique. It should be recognized that it is physically impossible for the engine to respond rapidly enough to maintain constant angle of attack and airspeed under all conditions.

4. Practice climbs and glides with entries from both straight and level flight as well as from level turns. As before, note throttle response and the ability of the system to maintain the desired angle of attack. The pilot should note that if the glide is too steep the throttle will remain against the aft throttle limit and indexer will show a FAST chevron Also, it should be noted that entry into a glide coupled with the return to wings level flight, will result in the indexer displaying a FAST chevron for a short period of time. One climb should be made wherein the rate of climb is gradually increased until MRT is applied. Also the pilot should simulate a waveoff. If coupled with a steep glide this maneuver will point up the inherent time lag in the system, and the reason why all waveoffs should be answered by the pilot overriding the system and advancing the throttle to the MRT or CRT position as rapidly as possible.

5. Practice disengagement by overriding the throttle.

6. Practice engagements with the airplane considerably slower or faster than the normal approach speed. The pilot should note that when the system is engaged at a speed considerably higher than the normal approach speed, the engagement is characterized by a rapid reduction of the throttle to the aft throttle limit. This can be startling to say the least, and the pilot should be aware of this trait. When the system is engaged after the airplane has been flying at a speed slower than the normal approach speed for a finite period of time, the engagement is almost as startling as the fast engagement, in that the throttle is immediately advanced. The throttle may remain forward for seconds after the desired angle of attack has been reestablished, result-

ing in the airplane accelerating well past the desired angle of attack/airspeed before stabilizing at optimum values. This characteristic was included for obvious reasons.

7. Practice field carrier landings under the control of an LSO. Make approaches from high and low starting positions, as well as exaggerated corrections for high and low meatballs.

During field approaches, *learn to anticipate* autothrottle response to maneuvers required to maintain the airplane on the glide path. Due to the nature of the system, it is necessary that the pilot alter his techniques slightly from those used during a manual throttle approach. In particular the requirement that the pilot initiate removal of any correction prior to achievement of the desired result is more pronounced. In other words, if the meatball is low and you ease back on the stick to recenter the ball, don't wait until the ball is in the center again before relaxing the increased back pressure on the stick, but lead the ball slightly.

Another change in technique is that the pilot is employing the stick to control attitude and the throttle to control angle of attack/airspeed. As always the proper attitude must be established prior to touchdown. With the system the pilot conceivably can make a correction for a high ball in close, which will require that the nose be lowered slightly. *Failure to establish the proper landing attitude after making the required correction — in essence a high dip — can result in a nosewheel-first landing.*

LSOs must be alert during initial check-out of squadron pilots for any tendency of a pilot to fail to establish the landing attitude when the airplane is in close proximity to the ground. It should be emphasized that no radical changes in the airplane's attitude be permitted in close proximity to the ramp.

A bonus feature of the autothrottle is that the improper occasional landing flare prior to touchdown results in a thrust application which cushions the landing.

For LSOs

LSOs will soon learn to recognize the characteristics of autothrottle approaches. Specifically the LSO will learn to look for familiar sounds and sights which indicate normal operation of the system. For example, he will learn to expect the familiar exhaust smoke of the F-8 to cease abruptly as the airplane intercepts the glide path and rolls out of the approach turn. Even more important the LSO will ex-

pect to see a large puff of exhaust smoke when the pilot rotates the nose of the airplane to keep from descending below the glide path, as the airplane slows down following initial glide path interception. In general the LSO will be accustomed to viewing cyclic bursts of black smoke as the airplane moves down the pike.

With field approaches it is important to understand that the aft throttle limit will at times prevent the airplane achieving the desired angle of attack under no-wind conditions, extremely cold weather, light airplane gross weight or any combination thereof. This poses a problem only at the field. Shipboard operations, with the attendant requirement for minimum wind over the deck, precludes the airplane from ever having to operate at a power setting less than that obtainable with the aft throttle limit.

System Failures

Many critics of the autothrottle are justly concerned about what happens when the system fails and the affected pilot hasn't made a manual throttle approach for the past 60 carrier landings.

During more than a year of tests where only two failures of the prototype system! Over 100 carrier and 300 field carrier landings were made during this period. One failure was attributed to a fuse being of lesser capacity than that required. The other was due to failure of a vacuum tube. (The prototype unlike the production system was not transistorized.) These facts are mentioned in defense of the reliability of the prototype system and not to dodge the excellent question of what happens when a pilot must make his first manual throttle carrier approach in months and it just happens to be one of those dark rainy nights.

There can be no doubt that the reduction of

airplane accidents will, as a result of the autothrottle, more than offset those that may be caused by random failures of the system. However, this doesn't help that pilot faced with his first manual approach since installation of the system in his outfit's birds. We believe that although the technique used in flying an autothrottle approach is different from that used in a manual approach, the pilot will not completely lose his touch for proper power control since he has been monitoring throttle movements during all his previous automatic approaches.

In reality the system is an excellent teacher of proper power control during the approach of the fledging *Crusader* driver. Pilots who had not previously flown the model commented on the instructional value of the autothrottle in assisting them in learning the techniques of power control so important to consistent and safe approaches in that aircraft.

We are of the opinion that the system will lessen the number of training flights necessary to prepare a pilot for actual shipboard operations. In asserting that the number of flight hours per pilot spent on field carrier landing practice will be less, we are aware of the necessity for the pilot to be qualified both day and night in manual and automatic throttle field carrier approaches.

This opinion is not based on mere conjecture, but rather on the fact that one of the writers had less than 15 total hours in all models of the *Crusader* prior to conducting the first actual carrier landing tests of the prototype system. Of this total, only about 5 hours were spent in field carrier work immediately preceding the actual carrier evaluation. The remaining 10 hours were acquired more than 6 months earlier, during fam and other project test flights. The subject pilot made both manual and automatic throttle approaches during the evaluation, and the automatic approaches were judged superior to the manual approaches. Today after increased experience in both, it is about even as to whether the pilot or the system flies the better approach. However, both pilot and LSO agree that the autothrottle is superior in the long run due to its consistency, which is more than you can say for a pilot who can have an off day now and then.

A possible solution to the question what happens when the device is inoperative is to maintain the pilot's proficiency in manual approaches by requiring that every third or fourth carrier landing be made employing manual throttle control. This method of attack should satisfy those who fear the pilot will lose his touch, but negate the increase in safety of operations to be gained by having the pilot make every landing using the autothrottle. No one can predict when a pilot will have an off day; if we could, we wouldn't need the autothrottle.

We should never lose sight of the fact that the LSO can always talk down the pilot with an inoperative autothrottle. Of the alternatives available, we prefer that the pilot field-qualify both day and night in automatic and manual throttle landings. Once field-qualified, all carrier landings should be executed employing the device. When a failure occurs — which should be almost as rare as an engine failure, the pilot with an assist from the LSO should be able to effect a safe carrier landing. Possibly the day will come when the pilot will be required to qualify only using the automatic system.

It has been recognized for years that something must be done to allow the pilot to catch up with the airplane, particularly in the carrier approach, and now the APC offers a significant step in this direction. It is not the complete answer to the problem, but promises to give the pilot more assurance on those dark nights with a pitching deck, and eliminate some of the classic carrier landing accidents.

LCDR Castruccio

As Project Officers in the Carrier Suitability Branch of Flight Test at NATC Patuxent River, the authors have been involved in extensive APC test work in addition to a wide variety of other carrier suitability projects.

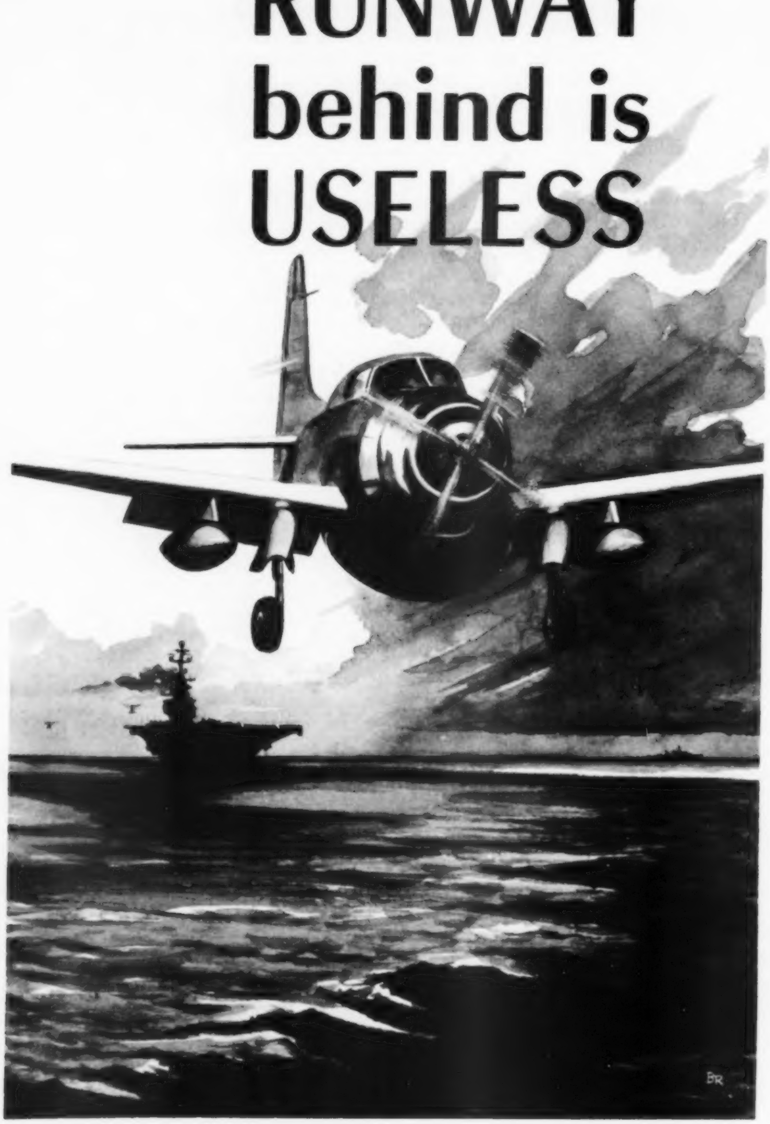
LCDR Castruccio participated in the tests and development of the APC from its inception to its present configuration and has logged many landings both ashore and afloat with the system. He has left Patuxent and is now undergoing RAG training prior to reporting to an East Coast squadron.

LCDR Billings performed some of the later F-8 APC tests and is presently continuing project work involving APC operation in other airplanes.

Both are members of the Society of Experimental Test Pilots.

LCDR Billings

RUNWAY behind is USELESS



I was scheduled to participate in a carqual period aboard a large West Coast carrier. The plans called for me to receive four refresher day landings, followed by four night landings that evening. I had completed four night refresher MLP periods which constituted my first carrier work since my return from a Westpac cruise.

All the squadron pilots received a thorough briefing from ship's company officers and following a brief by the flight leader on the morning of the accident, we prepared to man aircraft. I was to be no. 3 in a flight of four EA-1Es (AD-5Ws). A second refresher pilot was flying in the controller's seat and the rear compartment was occupied by an AD plane captain who had asked to fly aboard with us.

We were the first to start and leave the chocks and, after being joined by the other three airplanes, we proceeded to the warmup area, following taxi clearance. My aircraft was one of the better squadron planes and had received no major gripes in the last several hops. All the power plant checks were satisfactory and all radios and navigation aids appeared to be operating normally. I read the checklist to my crew and received acknowledgment from them.

At 1033 we were airborne and the flight executed an uneventful running rendezvous at 1000 feet. Proceeding to the ship, the clear weather quickly became a fog bank and we were cleared to 4000 feet to effect a weather reconnaissance of the operating area. Meanwhile we had discovered that both UHF receivers were very weak and we could hear transmissions only from the flight leader. It soon became apparent that it would take some time for the ship to escape the low fog and gain a clear area.

The formation consequently loosened up and we orbited the operating area for 2.5 hours. At this point we heard a command to switch to land/launch. This frequency was readable, although we did not hear any announcement of a Foxtrot Corpen, wind, or altimeter setting. After a gradual letdown, we dropped hooks and received clearance to enter the Charlie pattern, following the five E-1B

(WF-2's) already being recovered. The no. 4 man broke off to meet our Charlie time and the other three proceeded upwind to break. After establishing interval and breaking, I completed my checkoff list at the 180 position, having 95 knots and 450 feet. My first pass felt very comfortable, steady meatball throughout, but I received a foul-deck waveoff. The EA-1E's (AD-5W's) on deck were slowed down because we were discharging passengers after our initial landings.

I was no. 1 upwind, but on turning downwind, discovered two *Crusaders* were in the landing pattern. My pass was comfortable again, and when the second F-8 waved off, I had a clear deck. After the cut and arrestment, which appeared to be by the no. 1 wire, I taxied clear and my passengers left the aircraft.

I signaled to the aircraft director that my aircraft was up, but I could not launch until the rear compartment was secured. During this time I realized that I was to be deck launched from a point just to the left of my position and that there appeared to be considerable agitation on deck to expedite the launch. I went over my checklist while the rear hatch was being shut and secured and then followed the taxi signals to my launch position.

While the passengers were leaving the aircraft, I had studied the distance to the bow and did not believe that sufficient deck had been allowed for the launch. After watching another Able Dog launch from the same spot, however, and quickly weighing the facts that I was alone, had no external fuel or drop tanks, and was already reduced to 850 lbs. fuel, I judged that the distance was within limits, even if it was not very comfortable. As the flight deck officer gave the turn-up signal, I added power to 30″ MAP, holding my brakes, and checking my engine instruments, all of which were satisfactory. I saluted him, received the launch signal, and commenced to add full power.

During my deck run I felt that the engine was not developing full power. A quick glance at the MAP gage showed that I was between 45 and 50″ and that I had 2900 rpm. The engine should produce 55″, as it had on takeoff from North Island, but I cannot say whether it did or not because all my attention was now focused on my airspeed. At a point just short of the bow, where we normally would have 80-85 knots and would rotate, the aircraft had just reached 50 knots.

No time or room to abort at this point and as I left the bow, just reaching 60 knots of airspeed, I was struck by the irrefutable realization that the plane and I were to fly for only a few more seconds. I lowered my nose in a futile attempt to gain airspeed, held my heading, which was a few degrees starboard of the ship's course, and retracted the gear just before hitting the water. Realizing that the plane was already in a ditching configuration I concentrated on maintaining a wings-level attitude and was quite surprised at the relative lack of force of the impact.

Survival training became prominent at this point. After waiting for the water to settle, I released my straps and radio cords, pulled myself up to the edge of the cockpit, released my parachute chest harness, and pulled both life vest toggles. Being a swimmer of modest achievements, I was delighted to note that they worked immediately. Since the plane was still afloat, I was about to retrieve my flight jacket, oxygen mask, and yellow sheet board, when a severe crunch announced the arrival of the ship.

The ship tore the rudder from the aircraft, striking it five or six times as the ship's starboard side passed by. I had noticed the helicopter approaching as I inflated my mae west and consequently decided to abandon my parachute with its life raft. When I realized that the ship was striking the plane, I began to swim away. The helicopter was already directly overhead and the pilot and crewman effected a very professional rescue. I encountered no difficulty in entering the sling and was delivered safely aboard a minute later. (***Total time for rescue was 2 minutes 22 seconds.***)

As I was being raised into the helicopter, I noticed that the aircraft, which was still afloat, appeared to be intact through the wings and fuselage, although the engine had been torn off on impact and the rudder had been removed by the ship.

There is the definite possibility that the launch could have been completed successfully even with an engine producing less than full power. Even with unsatisfactory engine performance, additional room would have permitted the run to be aborted safely and comfortably. There is no justification for operating carrier qualifications and refreshers at a maximum pace and under minimum operating conditions. The old adage about "runway left behind is useless" holds true quite clearly in this case. ●

While fortunately or unfortunately military crews, except for MATS squadrons, do not have passengers in large quantity or feminine stewards to think of in times of emergency, the following words on panic treatment have some application to aircraft commanders' handling of crew leadership.

PANIC over PANIC?

Panic, as the word is ordinarily used by the layman, is not the inevitable accompaniment to an aircraft accident. In fact, panic of the type evidenced by a frantic effort for self-preservation without regard for others, simply does not occur frequently enough to be considered a problem for the cabin attendant.

A study reported by Dr. Barry King shows that of 315 passengers involved in emergency situations only one became hysterical and had to be controlled, and only two disregarded the cabin attendants' instructions. Their actions, although the result of panic, did not create a "contagious emotion," nor did they hamper the escape of the other passengers. No women or children were trampled in the aisles or crushed against the exits.

Cabin attendants should be prepared, however, to deal with a very different kind of panic during emergencies. Several reactions linked with fear, all properly termed "panic" by the psychologists and biologists, can be expected. These may take the form of hiding, paralysis, shrinking back. Dr. King says that "dazed" best describes a condition sometimes encountered.

Passengers dazed by an emergency are, in varying degrees, unthinking, unseeing, unhearing, even immobilized to the extent that they take no steps to save themselves. Some act as though they comprehend what is happening but do not associate the situation with themselves. A survivor of a crash overseas told later how he sat perfectly still and watched the fire advance, as he might have watched a movie. A pilot who ditched reported that for a while he sat fascinated and delighted by the beautiful color of the water that rose in the cockpit.

People in this condition are docile. As a rule drastic treatment is unnecessary, but it has been taken with good effect. A slip of a stewardess slugged a passenger who first tried to deplane at 3000 feet and then refused to leave after the landing was completed. He left, meekly and quietly. Another gal administered her special brand of shock treatment to a male passenger. She threw her arms around him and kissed him. This quickened his normal reaction pattern and started his engine.

But these were extreme measures. Usually a dazed passenger will respond to positive leadership. For best results:

- ►Keep yourself under complete control.
- ►Speak and act decisively.
- ►Unfasten the seat belt.
- ►Take the passenger by the arm.
- ►Speak in a loud, clear voice.
- ►If necessary, shout instructions but never scream at them.
- ►Remember that leadership is the key, so lead.

Dr. Joost A. M. Meerloo, noted Dutch psychologist and author of "Patterns of Panic" has written the Flight Safety Foundation (we asked him how to deal with passengers immobilized by fear) as follows: "In the acute mental shock stage a strong olfactory stimulus through ammonia (available in vials) or acetic acid will mostly be sufficient to snap the passenger out of his stupor."
—FSF Cabin Crew Safety Exchange ●

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Cause for Alarm

Anymouse Special

After an RON at Westover AFB, Mass., I filed IFR back to Oceana, about a two-hour flight in the A1 (AD). Departure time was a little after 1900 local – a dusk takeoff – all indications normal, and Westover approach climbed me to six in the vicinity of the field, with a short range clearance. Boston Center picked me up in due course, extended my clearance limit a bit further down the line, and New York Center reported radar contact after Saybrook intersection. As I recall, I received my terminal clearance from New York, and a courtesy vector on course to cut a corner out of my planned route of flight, and intercept Victor 139 in the general locality of "Pinta" intersection.

As I crossed Long Island Sound, in the last light before full dark, I could see that the broken layer above me was going overcast, and seemed to shelve down in the distance over the Island and the Atlantic beyond. I was prepared for a little night instrument flying, but felt quite assured—radar had me, and my nav gear, after some rouletting, settled down nicely. Above all, that old reliable 3350 out front sounded steady and tireless as ever.

I entered some good solid black stratus with intermittent rain showers at 6000′ just passing south of Long Island, and coming on course. The red glow of the instruments, the rain and darkness all around, and the continuous radio traffic, professionally routine, between New York and the numerous night flyers made my little world in the cockpit seem rather cozy and secure.

I checked the engine instruments, and noticed my carburetor air temperature was about plus 5°, a good temperature for carb ice, when one is driving through the rain. In accordance with procedures on which we had recently been briefed by engine reps, I pushed my mixture up to RICH, then selected alternate carburetor air. In the A-1H (AD-6) there is no intermediate carb air setting. It seems you have two choices: too much, and off. But 35° of carb air temperature is always better than ice, and I noticed my temperature gage climb obediently up to a high non-icing range, then went back to my instrument flying, mentally acknowledging the requirement to return the mixture to NORMAL once the automatic mixture control had had a chance to adjust to the new heat conditions.

Then two things happened at once. The engine backfired once, and the tacan DME and bearing unlocked. After a careful scrutiny of the engine gages, which revealed nothing, and after soothing my rattled nerves with recollections of similar responses by other A-1 (ADs) to carburetor heat, (but none really so violent and sudden), I called the Center somewhat apprehensively. I thought I was about to swing on course about the time of the backfire, and definitely wanted that confidence-building feeling of positive radar guidance. New York assured me that I had intercepted Victor 139, and I turned to the southwest, changing tacan channels in the hope of picking up at least a bearing indication from the tacan at the other end of the leg.

After selecting the new channel, I turned to the business of what to do about that single disconcerting backfire. Was it reason enough to divert? I looked over possible divert Navy fields in the area, and did some calculating and preliminary decision making, sometimes called temporizing, sometimes rationalizing. I was almost halfway home, through the most difficult part of the flight really, that is; I had my airport clearance and was just about past the high density traffic area—might as well go on. Then I recalled the mixture still in RICH. I moved the mixture cautiously into NORMAL and produced another, even more disconcerting backfire. "I have a problem," I thought, and peered about in the gloom. It ceased to be cozy in the cockpit. I was still determined to make it all the way to Oceana, if it was at all feasible, and besides, I thought, what a boondoggle it would appear to be, if I, an aging bachelor, should RON again, this time in the highly desirable metropolitan area? Perhaps if I took the damn thing out of carb air entirely, the good old mill would be restored to its pristine nonbackfiring smoothness.

I no sooner moved the toggle switch than I was rewarded with that same shockingly vicious explosion, this time apparently right in front of the cockpit in the air scoop. That yellow flash around the scoop, as a matter of

fact, ended all doubt in my mind. I called the imperturbable Center, and requested an immediate divert to the nearest Navy facility, because of an intermittent rough running engine. The response was heartening and I turned to a heading which would bring me across the shore line more directly than my airways heading, I hoped, to Lakehurst, or wherever the Center might decide to send me. I trusted those seasoned operators to head me to the first available Navy field, since although I did have a mileage reading on my tacan from the station at the end of that long leg, I was beginning to become fairly well occupied with the business of keeping my deteriorating engine turning. Then things began to worsen rapidly.

Intermittent backfiring occurred in spite of every combination of mixture, carb air, power setting, and even primer, which I could devise. Guard channel and my Center frequency became badly garbled, evidently in an effort to clear the air space between me and Lakehurst. I asked Center if they wished me to squawk "Emergency," but they replied, "No," and assigned me a new Mode 3 squawk, which they promptly picked up on their scopes, and so informed me.

Meanwhile, I was able to make out the lights of the Jersey shore, but my efforts to crank in Lakehurst low frequency range were unavailing. I did not notice the Lakehurst tacan, as I was quite familiar with the range, and unaware of the additional aid to navigation. Meanwhile, Center had given me no heading change; I wasn't sure where I was in relation to Lakehurst, and began to want the nearest place to land, no matter who controlled it. Over a continuously backfiring engine I asked for some information along that line, and I was informed amidst a great clamor on Guard and Center frequency that I was headed for Coyle, and my problem would be handled by McGuire Approach.

At this point, after gradually advancing the propeller control, I was at full high RPM, low pitch, with greatly reduced throttle, which seemed to retard some of the blasts from in front of the cockpit and around the stacks. I was still in RICH and still in alternate air. So concerned with the engine instruments was I at the time that I was quite startled to note my airspeed dropping steadily through 120 knots. Again I called Center and told them I was no longer able to hold six. They surprised me somewhat by clearing me down to three. This I rejected with growing exasperation, and was told to contact McGuire *now* on the approach frequency. I did, with some relief, and immediately began communicating with McGuire, still aware of two things; first, these people didn't realize the extent of my predicament, and second, I still had no idea where I was being headed. If I weren't cleared straight in to some runway soon, at the rate my altitude was falling off, I would have another big decision to make.

I was uncomfortably familiar, as squadron safety officer, with the odds against a no-injury bailout from the A-1 (AD). It's not really clear in my mind whether New York or McGuire told me to tune in Lakehurst tacan. I dropped everything and consulted my RF charts, and there, sure enough, was the tacan channel. I reflected that since this information wasn't classified, it might have been handier if I had been told what the channel was, but my radio communications had not been reliable enough to try to ask over the din, or at least what I recall as a frantic blend of many transmissions—some probably my own, as I became busier and busier.

Now the engine began to cut out completely, and McGuire, unaware, as I later learned and suspected painfully at the time, requested what sort of ground support equipment I would require. This perfect opportunity for rejoinder I was forced to let slip, and countered with the information that if I didn't have a runway in sight soon, I would abandon the aircraft. At that I switched my IFF/SIF to Emergency, but later learned that for some reason, although I recall pushing the red button, the squawk was not seen on the various scopes holding me. I requested the relative bearing from the blimp hangars at Lakehurst to the duty runway, which, McGuire said, was one-five. I was headed in from the east, and certainly didn't intend to enter downwind.

As I settled through 2500′, still with no runway in sight, but at least in the general area of the field, and with about 4 miles showing on my tacan, I thought about abandoning the aircraft. My decision *not to* was based on about four factors, which I can now review at leisure, but which were more instinct than reflection and conscious decision then. First, with the engine running at all, and it still did, in fits and starts, and then mostly backfire, I loathed the idea of leaving a plane that still might somehow or other make a runway. In con-

nection with that idea, I wasn't enthusiastic about relinquishing a whole, but sick, airplane to the autopilot and the night breezes in a fairly well populated area when something still might be done about flying it. The idea of parachuting held a certain sporting appeal to me at one time, but that night it actually seemed preferable to me to ride behind that big useless engine right into the pine trees; that was another factor—I knew the area around Lakehurst was pretty level, sandy and mostly covered with small pines. Last, as safety officer, I felt that anything was better than deliberately causing another Accident Report. I might survive the crash, but another accident report? My mind recoiled, and my senses reeled, as if from a strong smell. I would stay with the plane.

My last request was that the nearest runway lights be blinked. First, I was told that they were flashing, but I didn't see them, (which later was explained by the fact that they were not, as a matter of fact, blinking). Then, as I was approaching a point over the huge hangars, passing through a thousand feet, I saw the lights of runway one-five, three-three and, if I could nurse that now back-firing, now silent engine a little longer, I might be able to negotiate a close 90 and land crosswind and downwind on three-three. Although the primer had only produced backfiring before I decided to cut off the alternate air to reduce the general heat in and around the engine, and to try the primer again. The engine roared with great power, as if nothing in the world were wrong, then quit. I tried again, working the throttle vigorously, and solicited another more continuous surge of power from that treacherous engine, enough to put me happily in the ninety degree position I sought.

About then, the harassed McGuire controller made his last attempt to determine the nature of my emergency, which I thought was magnificently clear by then, and I was almost cackling with relief when I told him that I didn't have an engine, that was the trouble. With that, I took my finger off the primer, the engine obligingly ceased to run, and I began my landing, gear and flaps DOWN.

That was a long way from my best night landing, but it was, and will remain, my favorite.

I recall having mentioned the possibility of contaminated fuel to New York Center, but examination of the engine revealed that the trouble was neither fuel nor a carburetor malfunction in alternate air. Rather, No. 3 cylinder had cracked across the exhaust port, not across the combustion chamber. The result was explosive preheating, then pre-ignition of the fuel-air mixture in the intake pipe, and backfiring through the entire induction system, out through the carburetor. Cause of the crack is presently unknown, but it broke the pushrod housing open to add loss of oil to the generally bad situation. Throughout the emergency, however, except for carburetor air temperature, all other gages remained about normal.

In fairness to McGuire Approach, I learned that New York had dumped my problem in their hands with very little time to help me substantially, and with very little information about the nature of my emergency or even type aircraft. They apparently were led to believe the aircraft concerned was multi-engined. The situation is presently under review by personnel of both agencies.

We Can't Prove It But The Passengers Do Listen

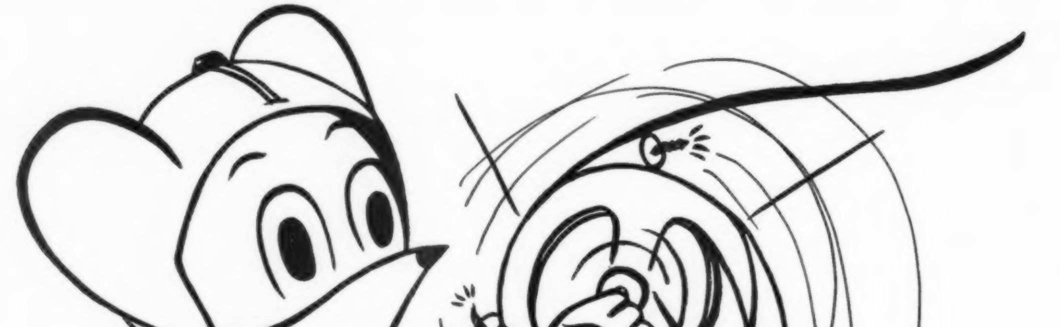
The following from Flight Safety Foundation is passed along for the benefit of aircraft commanders who have to brief passengers regularly.

One day a stewardess said to us, "Every flight we demonstrate how to use the oxygen masks but the passengers are completely indifferent. They don't pay a bit of attention." We patted her hand, just figuratively of course, in sympathy and understanding. It's real discouraging when people act as though they wish you would go away.

Actually most passengers are interested in your demonstration but they are not going to admit it. To display any curiosity about the emergency gear might convey the impression that they didn't know as much about flying as the Captain and that would never do. So they refold their newspapers or paw through their brief cases, while straining their ears so as not to miss a word you are saying.

Don't let this carefully camouflaged ("sneaky" is a better word) attention throw you. Keep right on demonstrating with all the verve and sparkle you can muster. You will be more than repaid the day the masks all drop and everyone knows exactly what to do. There is wonderful satisfaction in the knowledge that others still live because of you.

TAPE CAPER



Observer mouse on night competitive exercise hop with sister SP-2H squadron.

Between exercises, TACCO-mouse determined that the amount of tape remaining on the UNH-6 was insufficient for the next exercise. Not wanting to get caught in the middle of a hot problem with no tape, T-mouse decided to change to a full reel before the problem started. This bit of headwork impressed O-mouse, since items like this are quite often forgotten by T-mice, occasionally with embarrassing results. However, also determining that running the remainder of the tape *through* the recorder would take some time (about ¼ reel's worth), T-mouse came up with this procedure—or maybe it's regular procedure:

1. Remove both reels from the recorder
2. Cut tape
3. Stow the used portion away for posterity
4. Mount the unused portion, still on the reel of course, on a navigator's wooden pencil (Axle, substitute, Mk 1 Mod O)
5. Open periscopic sextant mount (Cleaner, vacuum, Mk 2 Mod 1)
6. Insert the free end of the tape into the sextant mount, grasp the wooden pencil firmly with both hands, and allow the tape to whistle away into the clear night air at 165 KIAS.

Observermouse was busily engaged with the score sheet at the time and didn't notice all these preparations. On noticing a loud whirring vibrating-like noise on the flight deck, O-mouse, seated at the radar operator's position, looked up to determine the cause of same—just as the tape reel disintegrated. Shards of broken plastic flew around the flight deck like flak. O-mouse felt a "thunk" on the left cheek, later discovered a small (⅛") cut at eye-level on the cheek-bone.

It's been known by almost all P-2 *Neptune* handlers that the sextant mount opening makes an excellent spot to dispose of paperwads, cigarette butts, apple cores and the like. The only improvement that can be made in this disposal system is to mount it in a pressurized aircraft like the *Connie*. What all this assorted garbage does to the heater inlet duct in the vertical stabiliz-

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —

er is a matter for airflow study specialists; O-mouse and several squadron mice feel that a hazard definitely does exist. Granted, this is not the proper *intended* usage of the mount, but *it is done*. (In fact, O-mouse knows of a PPC type who tried to get a piece of flex hose 12′ long with a fitting compatible with the mount so the flight deck could be cleaned up after each hop! Fortunately, such equipment was not provided).

It should also be well known to anyone who has ever seen a wheel/axle combination that a small, irregular axle mounted in a large, irregular bearing is bound to result in vibration. And vibration will ultimately make things come apart. With the amount of gear we wear and carry now on the P-2, a suit of protective armor just doesn't appeal to me.

Even disregarding the obvious misuse of the sextant mount, waste of Navy-bought magnetic tape, . . . , this appears to be a hazardous evolution for flight deck personnel (or, considering the heater inlet again, quite possibly the whole crew). 1 inch or less lateral head movement and this mouse would have been reduced to the use of the single-eye whammy instead of the dual-mounted version. If this practice is widespread in VP outfits (let's hope not), O-mouse heartily recommends that someone initiate action to stop it before serious injury results.

Hasty Preflight

While flying an A4B (A4D-2) on a weekend cross-country, we stopped to refuel and RON at NAS Pensacola. Heavy transit traffic caused a somewhat frustrating delay in our departure. When it came our time to go, the aircraft was given preflight which included checking the proper position of each fuselage panel from the ground, and again just before entering the cockpit. From both positions, the access door to the internal fuel tank appeared properly screwed in place. Since the aircraft was refueled by single point pressure refueling system, no thought was given to double checking the proper position of the cap itself. For some reason, both the access door and the refueling cap had apparently been removed, and although the access door was in place, it was not properly secured to the fuselage.

Approximately six minutes after takeoff, my wingman noticed fuel streaming from the fuselage tank, where upon we immediately returned to Pensacola and landed without further incident. Post flight inspection revealed two holes immediately aft of the internal fuel cap access panel, and another hole along the leading edge of the starboard horizontal stabilizer caused by the fuel cap being blown off in the wind stream.

This experience reemphasizes the need of detailed preflight inspections, especially at unfamiliar bases.

Sky Wire

While cruising on the low level portion of a Nav Profile flight at about 75 feet altitude as chase pilot, I heard the lead pilot say "Wires!" There were two of them, power lines running from Honshu Island to the small island of Tsuno-Shima (34° 21′, N, 130° 54′ E).

The leader went under and by applying 3½ Gs I went over.

I'm sure I would have hit the wires if I hadn't pulled up when I did and I'm lucky to have a head to wear. Very low cruise had become old hat for me but this should not have happened. Minimum altitude for that portion of the approved route is 500 feet – and minimums *mean* minimum.

Touch and Go

This seemed a small enough error at the time—not even any damage done. But I wonder how many pilots do something equally as stupid when the habit pattern is broken.

This was in the days when it was an A4D-2 instead of an A4B and we had been on a double-cycle high-level nav hop. As per current directive we switched to manual fuel control during our descent to the ship.

Everything went smoothly until after arrestment. I had previously determined that I would switch from MANUAL to PRIMARY fuel after being trapped so that I could look good coming out of the gear and still not take the chance of overtemping the engine when adding power.

So the muddled sequence of events in the cockpit went something like this: "Let's see, hook up, and don't forget to switch to primary. Okay, there's the switch. Now throttle up and don't forget the flaps (at this time the nose wheel is cocked so it takes a little playing to get it straight). Now, there was something else to do to get the cockpit cleaned up. Oh yes, the flaps . . ."

And at this point I reached for the gear handle and pulled it!

Thank heaven for the retraction release switch—and that it was functioning properly. Otherwise, another stupid pilot-error accident would have happened.

Previous to this accident, it seemed inconceivable to me that *any* pilot could inadvertently raise his gear on the deck, or even try to. I'm a believer now.

Moral? I guess the closest is "haste makes waste." ●

HEADMOUSE

Parachute Harness

Dear Headmouse:

Why not line the inside of the standard parachute harness with a thin layer of white foam rubber. The advantages are twofold. *One:* a non-airdale could readily see if his harness is twisted — the white sides would face up. He would realize the foam rubber is supposed to be inside (against his body). *Two:* comfort. The harness is supposed to be tight fitting and has a slight tendency to "bite." This is irritating to the tenderer parts of the body. A layer of foam rubber might even reduce the opening shock of a parachute.

COHEN AG3
NAS Pax River, Md.

►During the evolution of the parachute harness, since the advent of nylon harnesses, we have witnessed a pleasant change in the texture of material used for their construction. We started with the rigid Type X harness, progressed to the much improved Type XIII (which in some cases is still with us) and then to the present very flexible, soft-textured, all-weather harness predominantly in use. It is possible that this Anymouse's contact with harnesses has been with the more rigid Type XIII harness which is being phased out on an attrition basis. If so, I am sure he would be pleased with the improved all-weather harness.

This Anymouse's interest is indicative of the increased emphasis being placed on improved safety and survival equipment. However, we must disagree with him.

Under no circumstances should a non-checked out person don a parachute harness for flight unless under the close supervision of a qualified person. Once donned correctly under supervision, no twists, etc., can be encountered.

Contrary to common belief, a parachute harness is not supposed to be *tight*. It is to be adjusted until a suitably snug fit is obtained. One should not adjust it to the point of discomfort. Although a foam rubber lining sounds good from a comfort point of view, there are several drawbacks that must be considered.

To attach the foam rubber, the most practical method would be to sew it on. Stitching, however, tends to weaken a harness. This also would be major overhaul type work and would have to be done at the O&R level.

Parachute harnesses used in transports generally last for a relatively long period of time. If foam rubber were attached it is very likely that the life of the foam rubber would govern the life of the harness (or at the very least a major overhaul period) which would certainly be considerably shorter than that which now exists.

There is the strong possibility that the use of a soft rubber lining could lull the novice parachute harness wearer into believing that he has a snug fit when, in fact, there would be enough slack present to transmit a more severe opening shock force to his person.

Very resp'y,

Headmouse

BACSEB Listing

Dear Headmouse:

I have just received a copy of "Naval Aviation Biophysics and Survival Equipment Publications Index," listing (starting on p. 25) all the outstanding and active BACSEBs. Our records indicate a considerable quantity still outstanding and active which are not included in this Index. Would it be possible for "Crossfeed" or some other medium to publish a complete listing starting with BACSEB 1-54 and all subsequent bulletins, indicating the cancelling publication for each

A TIMELY REPORT OF YOUR INCIDENT MAY

Have you a question? Send it to Headmouse, U.S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

obsolete BACSEB and also note in which section each active bulletin should be filed?

ANYMOUSE ED CAMPBELL
GRUMMAN AIRCRAFT ENG. CORP.

►It would be impossible for us to publish a complete listing of BACSEBs giving all references and reasons for cancellations. Many of these bulletins are dropped from the listing because they have served their purpose. Furthermore, few commands keep a backlog file of supplements to "Cognizance I" of NavSandA 2002 Manual (the Safety Center does not). Going through such a file would be the only way to research a project of this type. BACSEB numbers are assigned by BuWeps in block lots to the cognizant desk. Some of these numbers are never used because old equipment necessitates replacement vice modification or because less than the anticipated amount of difficulties occur concerning the assigned equipment.

If a publication is not listed in NavSandA 2002, section VIII, parts C and D, or in the monthly supplement, you can rest assured that the publication has been removed from the effective list. However, in a list of this type in which the total items run well over a million, surely mistakes can be made. If you suspect a mistake, write BuWeps a letter requesting further information as to why a bulletin has been removed from the effective list when you think there should be a bulletin on this subject.

Very resp'y,

Headmouse

You WROTE the caption!

"Sometimes I wonder about those calendar checks."
"If this taxi signal isn't standard I've had it."
"It looked pretty good until they dropped it."
"Well that wraps it up for today."
"Say Chief, Do you think that crane operator knows what he's doing? Boy, I hope so."

—LT DANIEL R. BILICKI, USNPG SCHOOL

"Yessir, the Dependent's Cruise, and I told my little brother to go ahead and look around the cockpit a little . . ."

LTJG GRAHAM H. HICKS, JR., FPO, SAN FRANCISCO

"Say that was some autorotation demonstration wasn't it?"
"It's too bad we can't sweep it under the rug."

—GEORGE D. FRAME, JR., AMH-1, HATRON 4

"Ground checks O. K."

—CDR GALLAGHER, VA-196

"After its next flight, I think *we should* pull a check on this aircraft."

—M. J. COSMO, YN3, HU-4

"It was cross eyed at birth."

—W. V. GOUGH, JR.

"Man, can that cat auto!"
"No, not the blade fold switch!"

—JOHN J. LEHMAN, ADR2, NATC PAX RIVER

"Chief . . . why wasn't this aircraft serviced? It's scheduled for a 1400 flight!"

—LCDR J. C. REDFIELD, USCG AIR DET. KODIAK

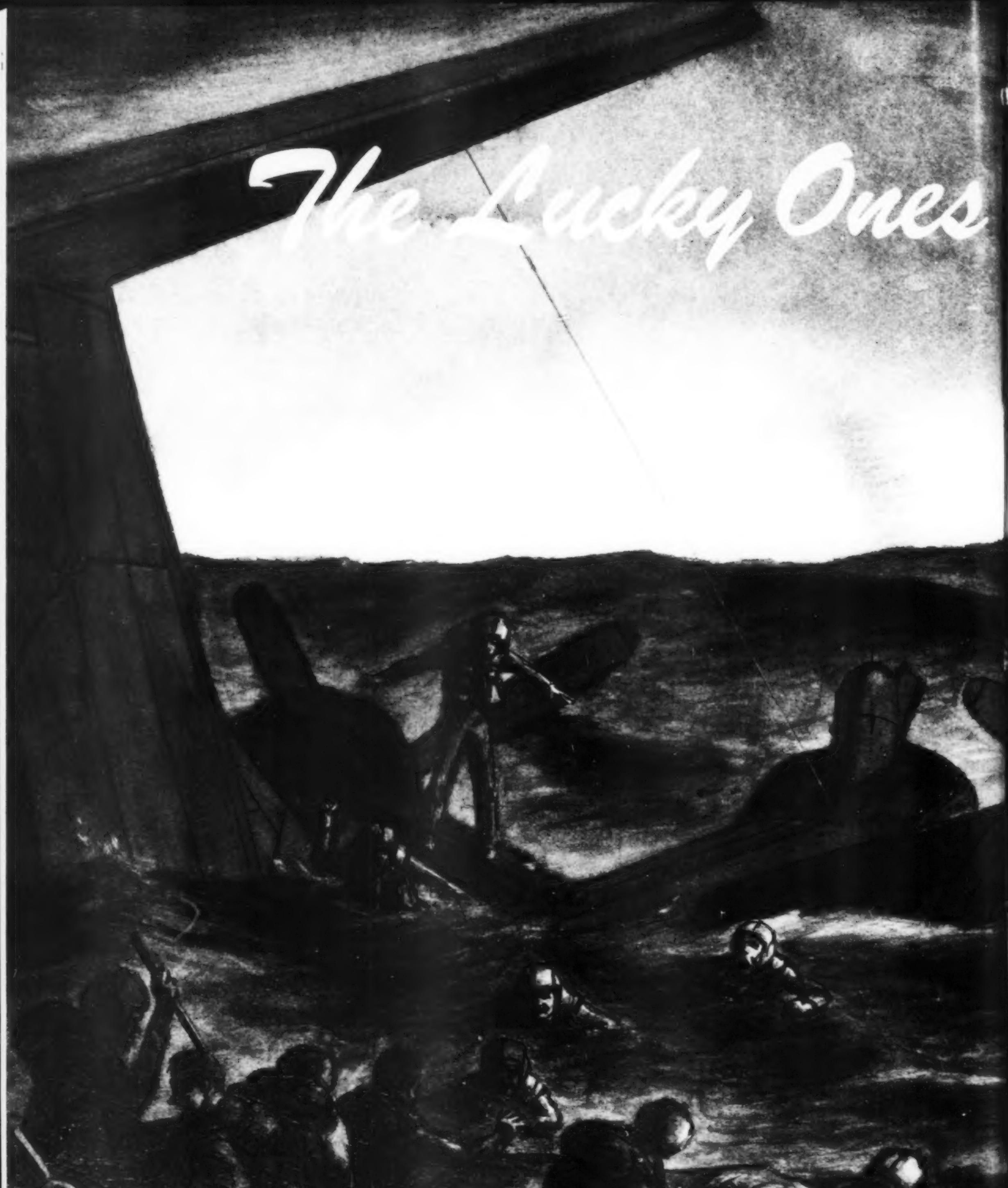
"Oh my gosh" We just finished Field Day, and have material inspection in one hour! Who put this mess here?"

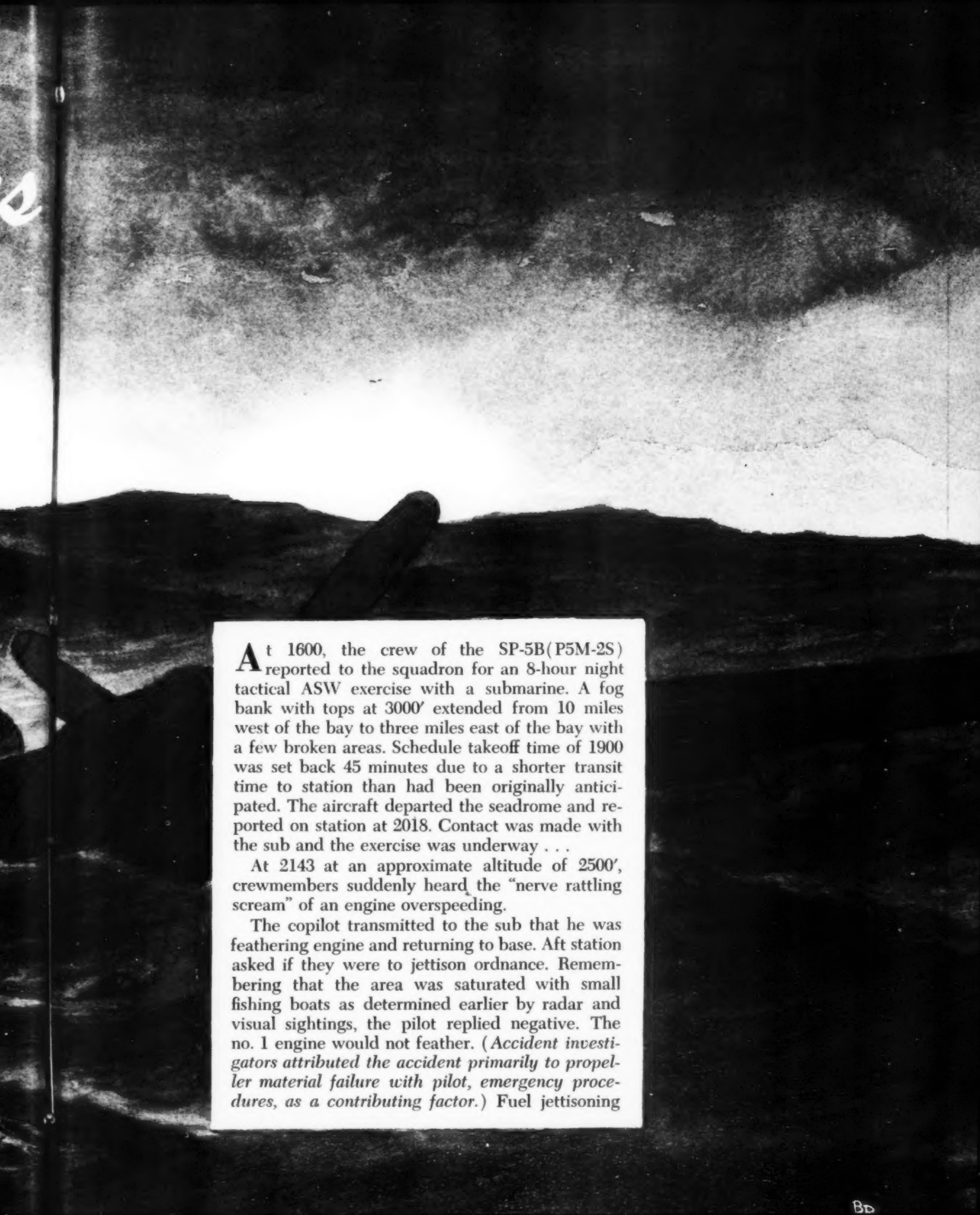
—WILLIAM R. RUGE, DT1, FPO, NY

"Take it below fellows we'll launch it in the morning."

—B. L. (PAPPY) LAURANCE, ADRC/AP, NATTU, PENSACOLA, FLA.

PREVENT AN ACCIDENT AND SAVE A LIFE


The Lucky Ones



At 1600, the crew of the SP-5B(P5M-2S) reported to the squadron for an 8-hour night tactical ASW exercise with a submarine. A fog bank with tops at 3000′ extended from 10 miles west of the bay to three miles east of the bay with a few broken areas. Schedule takeoff time of 1900 was set back 45 minutes due to a shorter transit time to station than had been originally anticipated. The aircraft departed the seadrome and reported on station at 2018. Contact was made with the sub and the exercise was underway . . .

At 2143 at an approximate altitude of 2500′, crewmembers suddenly heard the "nerve rattling scream" of an engine overspeeding.

The copilot transmitted to the sub that he was feathering engine and returning to base. Aft station asked if they were to jettison ordnance. Remembering that the area was saturated with small fishing boats as determined earlier by radar and visual sightings, the pilot replied negative. The no. 1 engine would not feather. (*Accident investigators attributed the accident primarily to propeller material failure with pilot, emergency procedures, as a contributing factor.*) Fuel jettisoning

'All indications are that the ditching procedure

was commenced shortly after the overspeed.

Unable to maintain altitude, the pilot gave the order to man ditching stations. The port engine was secured and a turn to 270 degrees was made to ditch into the wind. Flaps were not used. Though weather in the area was 600′ overcast with one mile visibility with fog, weather in the area of ditching was clear with a sea state of 3.

First impact with the water was moderate. Because of the darkness, the copilot was initially unaware that the aircraft had bounced high. Then realizing the height of the bounce, he reapplied full power to the No. 2 engine; the pilot held nose attitude and wings level. One of the crew said later the aircraft "seemed to float airborne for a lifetime."

Second impact was violent. All watertight doors popped open. Both beaching gear hatches blew and water rushed in with the spray coming up on the flight deck. All after station hatches remained closed. There was a blinding flash of light as the searchlight arced and remained on for several seconds.

The copilot made a partial reduction in power and reapplied power as the aircraft bounced slightly and settled back on the water for the third and final time. After a short runout it came to rest. Mixture was cut on the No. 2 engine and ignition switches were secured. A great wave of water and fuel swept back aft. Water was rising to the top of the forward side of the ditching panel by the time the men behind the ditching panel unstrapped and stood up. Within a minute after the aircraft came to a stop water was level with the flight deck.

For a short time, the white lights were on in the aft station. The crewmen got out the Mk7 life raft and inflated it. Two men boarded the raft and others handed out smoke lights, the Gibson Girl and a bag of quick-donning anti-exposure suits. When the last man was pulled into the raft, the after station was half submerged.

Up front, the pilots had left the cockpit. Grabbing the Very pistol, flares and flight deck raft, they climbed out onto the wing. Both the pilot and copilot tried to get the raft inflated but "were not up on their procedures."

(The raft lanyard is connected to the neck of the cylinder. The lanyard should be followed down to the cylinder neck where the flap on the end of the cylinder should be lifted and the cable actuating device under the flap pulled. All multi-place rafts have a hand pump in the oar pocket inside the raft for use if anything goes wrong and the cylinder actuation valve does not operate.—Ed.)

As the plane began to sink, the men on the wing dove or jumped into the water and swam to the inflated raft. A head count showed everyone present. The radar operator, noticing that the raft wasn't moving away from the aircraft, looked down and saw a white cord running from the raft underwater into the aft hatch. Realizing the cord was secured to the aircraft, he cut it with his survival knife and the raft moved away. The aircraft continued to sink; clouds of steam billowed as the cold water struck the engines. About 1500 yards away a smoke light burned in the water—apparently fired from the retro on impact.

About a mile away the running lights of a vessel that was heading toward them were visible. From the height of a searchlight over these lights, the survivors surmised that it was the submarine.

However, since the submarine had not been notified of the ditching, recognition was not at first mutual.

"It was a very dark night, yet lights could be seen very distinctly," the sub skipper reported later. "I was looking through the periscope, trying to determine that the bow had in fact broken the surface when I noticed a group of unusual lights off the port bow—strange lights for a small ship—about 3000 to 4000 yards out. It disturbed me to think that I had not seen this ship—or boat—before this. Then I was amazed at its speed and assumed it must be a hydrofoil of some sort. By the time I was convinced the sub was well-surfaced and had sent the officer of the deck to the bridge, the fast boat had come to a stop about 3000 yards up

was not orderly and not completed.'

ahead. The lights were very peculiar and now there was a float light burning. Suddenly it dawned on me that this was probably the aircraft . . .

"Searchlight was rigged and swimmers, rescue party and corpsmen were called for. It was not until the range was closed to about 600 yards that there was no longer any doubt that it was, in fact, a downed aircraft. A battery powered microphone was used to hail the life raft only dimly seen on the starboard bow. In the darkness the sinking tail was barely visible on the port bow. It was determined that the entire crew was in a raft and uninjured."

The men in the raft fired flares and Very cartridges and turned on their vest lights. Copilot and radio operator were clinging to the side of the raft in the water. When the cold became unbearable, they were pulled aboard. As the overloaded raft began to take water, the survivors bailed it out with their hard hats. Practice depth charges went off in two separate explosions but the shock was not severe. At this time, the tail of the aircraft sank from sight.

The bow of the sub was turned toward the raft and a swimmer with fins and an uninflated life vest swam from the sub to the raft and fastened a line to it. The raft was then towed to the side of the sub. A boat hook held by a man on deck and another held in the raft kept the raft off the side and prevented it from capsizing in the 4 to 5′ swells. One at a time, the survivors were pulled from the raft by men hanging on the side of the sub.

"We were extremely lucky not to lose any of the flyers in getting them aboard the submarine and extremely lucky not to lose any of our men over the side because the swells were high and breaking over the deck," the sub skipper reported.

Though the survivors were shivering uncontrollably from the cold, they were in good condition with no serious injuries.

Many fortunate circumstances and proper actions by personnel involved helped prevent injury or loss of any crewmembers in the ditching, the AAR stated. (According to an endorser, the crew was newly formed and had flown only three flights together since completion of the ground training syllabus. The officers were members of the old crew but only two of the eight enlisted personnel had been in the crew for more than five weeks.)

Among the things that contributed to the successful outcome of the ditching were:

- Landing near the submarine.
- Lights remaining on in the aircraft after ditching.
- Failure of the aircraft to burn even with ruptured gas tanks.
- All crewmembers kept calm.
- Prompt, effective, alert and proper action by the submarine skipper and his crew in effecting the rescue under difficult conditions. Especially praiseworthy were the actions of the man who swam to the raft.

A number of factors indicating deficiency in survival training were cited in the AAR:

- Several crewmembers were not wearing parachute harnesses at the time of the malfunction and some of them subsequently left their stations to put them on.
- No ditching drills had been held for the preceding month.
- Two crewmembers failed to get completely strapped in prior to impact.
- Some crewmembers did not have hard hats on during the ditching.
- Most crewmembers also did not know how to actuate the life raft CO_2 bottle.
- The ditching net was not rigged on the flight deck.

The board concluded that the status of crew training was not a contributing factor in this accident though it could very easily have been serious. "All indications are that the ditching procedure was not orderly and not completed. The success of the maneuver may be considered due to a few individual efforts rather than an organized crew effort," the board stated.

The board called for more intensive training in the use of survival equipment and proper survival techniques for pilots and crews at the squadron level.

RETRO EJECTOR FIRES

Two maintenance teams were working on a patrol boat. One team was checking out a gripe of smoke from the remote control box and the other, a gripe on a hydroflap.

Fatigue was implicated in the accident. The AO2 who accidentally fired the retro ejector had been on duty the 24 hours preceding the accident. Due to the heavy work load during the operational readiness inspection, he had had only four hours' sleep the night before. After the accident he told the flight surgeon, "I was so sleepy and groggy when I went out to the aircraft I could hardly see."

The ejector system was loaded to check out the smoke gripe. After it was established that smoke was not being emitted from the remote control box, the ordnance crew opened the ordnance panel. They observed no smoke. Waiting a few minutes to be sure, the AO2 then reached for the panel to put it back into place. When he picked up the panel, he accidentally hit the firing switch and the retro ejector fired.

Meanwhile, two AMs had been working on the hydroflaps to determine why one did not extend fully. This necessitated their climbing in and out of the aircraft, to check various controls. At the time of the accident, one of the men was at the top of the ladder entering the port waist hatch. He was completely inside the hatch except for his left leg which was on the ladder. The other man was on the ladder behind him, his head level with the first man's foot. When the retro ejector fired, the marine marker passed through the first man's leg just in front of the second man's face.

Squadron policy is to take in the ladder and to post safety guards inside and outside the aircraft to warn personnel away whenever the retro system is to be test-fired.

The investigating flight surgeon offered the following conclusions:

- This accident was preventable. If the proper safety precautions had been taken by the ordnanceman in charge of the repair job, the accidental firing of the retro ejector would not have injured this man; the gun would not have been loaded.
- Safety must of necessity begin at the top. In this case, the proper safety precautions had been decided on, included in the squadron instructions published by the safety officer, division officer and maintenance officer, and then ignored by the petty officer in charge of the ordnance shop. Any criticism towards the safety program must be directed towards those directly concerned with carrying out the promulgated instructions in this case.
- As the factor of fatigue may well be an important one in this accident, the squadron is reminded of the numerous studies carried out by various medical and aviation teams demonstrating the fact that sleep and efficiency go hand in hand. A person carrying out an important and potentially dangerous job should not be called on to perform that job with only four hours' sleep in the previous 24 hours. *It is recommended that realistic maximum work hours versus rest hours be established for ground crews as well as flight crews.*
- First aid performed on the ramp was excellent. Seeing that the wound was too massive for direct pressure on the wound to stop the bleeding, the injured man's shipmates applied a tourniquet correctly and the bleeding was controlled. The man was not moved, thus preventing further injury to the already severly injured extremity. The action taken is commendable and reflects a high level of awareness of the basic principles of first aid by squadron personnel. ●

Know the Work Hazards—Don't Learn of Them by Accident.

Hypoxia

Hypoxia
Hypoxia

The first 35 to 40 minutes of the scheduled night practice radar intercept mission at 25,-000′ seemed normal enough. The replacement pilot (RP) had completed three successful intercepts when the instructor pilot flying the target aircraft began to notice a deterioration of the RP's radio discipline and procedures and his radar techniques. Instructions seemed to confuse him and he asked for repeats.

A little over an hour after takeoff the RP informed the instructor that his cabin pressurization had failed and cockpit altitude was now the same as aircraft altitude. He stated he was descending to 19,000′ to continue the mission. Five minutes later he transmitted that he was feeling sick and returning to the field. The controller gave him a steer to home plate and cleared him to descend.

The instructor made a running rendezvous on the RP, catching up with him at 9000′, 40 miles out from the field. Totally disoriented, the student was in a shallow right turn, passing 270 degrees. The instructor, requesting various cockpit gauge readings in an effort to keep the student alert, steered him back to home base. He instructed the student to check his oxygen on 100% and shift to safety pressure. The descent was continued to 2000′ About 14 miles out from the field, they shifted to tower frequency. The RP's position report indicated disorientation and confusion. The instructor continued to fly a wing position around the pattern as he discussed the situation with the RP. They landed without further incident.

Immediately on landing, the RP was taken to sick bay for medical examination. The aircraft oxygen system was checked out but no leaks or malfunctions were found. The regulator tested out satisfactorily. The RP's mask was found to have a leaky hose and sticking exhalation valve. Fifteen days previous to the incident the mask had been checked and cleaned and was working properly. There was slight evidence of dry rot in the folds of the hose but at the time of the examination the inspector had considered it in good working order. The mask had worked trouble-free prior to this flight.

The RP's condition was normal on physical examination. However, the flight surgeon concluded from the account given by the RP and instructor that it was quite evident that the RP had been hypoxic to some degree.

Instead of the RP shifting to safety pressure, the investigating flight surgeon felt that the emergency bailout oxygen bottle should have been actuated. This, he says, would have been a much better procedure to have followed because the oxygen from the bailout bottle enters the pilot's mask at the base of the hose connection and does not utilize the aircraft system. The student's previous oxygen training should have caused him to descend below 10,000′ as soon as he discovered failure of the cabin pressurization system, in the flight surgeon's opinion; however, there was no way of knowing to what extent the RP was hypoxic prior to the failure.

The flight surgeon recommended that:

- Pilots exercise particular care of their oxygen equipment; having it checked and cleaned at frequent intervals.
- The bailout oxygen bottle be used whenever a hypoxic condition is supected in any flight crew member.
- In the event of any cabin pressurization malfunction at altitude, a descent be made as soon as practicable to an altitude below 10.000′

2-Hour SURVIVAL

The cause of the helicopter flying into the water during a night ASW training flight is unknown—the instructor and student pilot were lost. Though the aircraft went in without warning, the two crewmen—a sonar operator instructor and a student sonar operator—managed to escape.

Here is the sonar instructor's description of his escape, survival and rescue. . . .

As the thought "Why are we turning out so slow?" ran through my mind, we hit to the left side, nose down. I was jerked around to the right in my seat. The aircraft seemed to skip, there was a big flash of light and sparks, and I heard shorting out. The instructor pilot threw his forearm over his face and then the plane filled full of water from forward.

I took a deep breath of air. I felt like I was on my back like the Dilbert Dunker effect but to the side. Lights were still burning on the sonar stack about 45 degrees above. It felt like the other crewman fell past me off my left shoulder. I decided if I went by the middle console I would find the starboard crewman's escape hatch. The hatch was half in, half out of the water. I pushed with my hand and then with my elbow, but the hatch would not give. Finding footing, I butted the hatch out with my SPH-1 helmet.

Once outside I felt the sponson with my hand—pushed away from it and swam 15 feet, rolled over and pulled the right toggle on my life vest. Turning toward the plane, I yelled for the other crewman. He was silhouetted as he came out of the same hatch I had escaped through. He answered and swam toward me. I pulled my other life vest toggle. The other crewman had some trouble with his vest toggles so I pulled both for him. We swam a little further away. The plane was upside down, nose down with slight port list. I looked at it to see if anyone else was out.

After taking my raft off and deploying it, I had the other crewman get into my raft and made sure he was OK . . . told him to take his raft and deploy it for me. Swam back over to the aircraft and went up alongside of sponson. Every time I got near the aircraft the waves would push me away. I touched the aircraft once and then with one kick was in front of it. The plane was making sucking noises as though it was going to sink. The other crewman and I talked all this time—I remember reading some place to keep talking.

After swimming back, we got the other raft deployed. I pulled myself in on my stomach and swallowed salt water in the process. Several times I hollered for the pilots by name. By this time the plane had sunk lower in the water and we had drifted about 50 yards away from it. I began to feel nauseated; after about 5 minutes the feeling passed and we talked some more. I thought about going back to the plane again but it was lower in the water and further away.

We had drifted about 100 yards away but we could see the tail rotor with one blade sticking up out of the water. We turned on our flashlights and yelled the pilots' names again. Now we could hardly see the plane but could still hear sucking, washing noises. In between these sounds it was real quiet.

The swells were getting longer. We talked

about how long it would take to be picked up—just kept floating and talking. Because the fuel was really thick around us with heavy fumes, decided not to use our flares. I turned my flashlight off, but we kept the other crewman's on. We didn't know how long we would be there but we knew that we were due for a half-hour position report. We began bailing out the rafts—they were tied together and the sea anchors were deployed. I used my hard hat to bail with—had taken it off before swimming back to the aircraft and had given it to the other crewman to hold.

Took a look at the flares on my life vest again but there were still fuel fumes around. We drifted further and further. I decided to hold the flares until I saw an aircraft.

Finally I saw an aircraft to the north. Took my compass reading but still did not use the flares because of the fumes. The aircraft proceeded eastward a long way off. Then thought I saw a helo coming from the beach low on the water. Decided the fumes had subsided and it would be safe to fire a flare. A helo appeared about five miles east, coming towards us. My hands were cold—had lost my gloves—so gave the flare to the other crewman. He fired it—it burned for only 5 seconds before it went out. My second flare did not ignite. The third one spewed but did not light.

By this time, the helo had turned south and appeared to turn toward the beach. I pulled out the other flare and decided to wait until another aircraft was closer in. Then we saw a fixed wing aircraft coming from north to south. He went into an easterly turn. We decided to fire the remaining flare but we got confused and the second crewman fired the daysmoke end; it got hot so he threw it in the water.

The fixed wing aircraft came back and dropped an overhead flare right over us. We saw a helo circling the flare. Two other helos came and one proceeded westerly.

I was excited about being picked up. The flare played out at this time. Planes appeared to be moving away gradually. I was waving my flashlight at this time and the helos came back toward us. . . . We put our hard hats on when the helo was 100 yards out and abandoned our rafts as the helo came to hover. I swam to the sling and took in a big mouth of salt water as I got in it. Was hoisted into the cabin—the hoisting was routine. They got me out of the sling and I scooted back to clear the after cabin. . . . The second crewman was brought aboard. I was so cold the helo crewman pulled soundproofing off the port side and covered me with it. They took some off the starboard side for the other crewman. I was very chilled at this time but when I stuffed the soundproofing around me, I began to get warmer. . . .

• • •

The survivors had been in the water some two hours. ●

notes from your FLIGHT SURGEON

No Safety Goggles

AN ADJ2 was servicing the utility hydraulic accumulator on an F4B (F4H-1). He saw the gage pass 1000 psi and then the glass front of the reading gage exploded due to a material failure. A fragment of glass struck him in the right eye. *He was not wearing safety goggles.*

Medical examination revealed an L-shaped cut next to the pupil which extended almost into the interior portion of the eye. Just below the pupil there was a deep gouge. Other surfaces of the eye were scraped deeply. Blood was detected in the chamber in front of the lens and there was fear that the lens had been dislodged. When the medical officer's report was submitted, the accident victim was being hospitalized for an indefinite period. It was not known at that time whether or not he would retain sight in the injured eye.

• • • •

The contractor has recognized this potential gage hazard and has provided safety vents in all subject gages now being delivered. This vent can also be placed in all subject gages now in service. (The print showing the rework is drawing no. 32-017313.)

Tight Shoulder Harness

TWO pilots ejected from a TF9J(F9F-8T) under negative G-forces and in an inverted spin. One of them reported having to put his hands under the canopy rails to hold himself down.

Under these conditions a loose shoulder harness and lap belt can add to your problems . . . you will be thrown around in the cockpit more . . . you may have trouble finding the face curtain since you will not be in your normal accustomed position . . . and you will get more severe onset of G-forces on ejection since the seat will accelerate before lifting you, increasing your chance of spinal injury.

Distraction

AFTER an apparently normal night catapult shot an F-3B (F3H) crashed into the sea approximately one mile ahead of the carrier. The pilot was not recovered; however, the pilot's helmet and oxygen mask was. The flight surgeon in his investigation states, "(Analysis of the pilot's personal equipment indicates) that the pilot's oxygen mask may have disengaged prior to the accident. If this is true, it might have broken the pilot's scan during this critical period and caused the accident." He recommended that, *"all parachute riggers* should be reminded that the Sierra fittings must be kept free from corrosion, grease and other foreign material if they are to perform properly; that all pilots, prior to donning their helmets, should check and see if the Sierra fittings are functioning properly and free of foreign material."

Poor Fit

During the F-8 (F8U-1E)'s post-takeoff climbout, the canopy plexiglas imploded. Pieces of plexiglas entered the cockpit, damaged the pilot's helmet, broke the visor and cut his face. He immediately reduced power, declared an emergency and landed without further incident.

The Aircraft Accident Board's report stated that serious injury and possible loss of this aircraft were averted by the pilot having his helmet visor down. The report commented that the poor fit of the visor to the oxygen mask makes some pilots reluctant to use it. Under certain flight conditions the line of light between the oxygen mask and the visor makes it very difficult to see the instrument panel. Recommendations concerned redesign of the visor for a better fit between visor and mask and investigation of the practicability of a clear visor.

A report on a successful ejection brings up the same mask-visor problem. The pilot was well-equipped with the proper safety, personal and survival equipment. All equipment used functioned properly, but he did not have his APH-5 helmet visor down. He habitually leaves the visor up because the gap between visor and oxygen mask gives him a "bifocal effect."

The following portion of BAC-SEB 24-58 of 18 Dec 58 describes fitting technique to improve poor integration of visor, and oxygen mask: *Excessive gap between the nose and visor in extreme "down" position can be corrected by substituting a thin crown liner or thin back liner for a thick liner. As an alternate method of correcting improper integration, pinch the portion of the mask around the*

top of the nose before pulling the visor down. In most instances, on releasing the pinched portion, after the visor is down, the rubber material of the mask will flow under the visor and make for a good integration. Tilting the helmet forward slightly also will assist in the integration.

Further information related to visor-mask problems can be found in BACSEB 35-60 of 15 Sept 60, Helmet, Protective Pilot's Type APH-5, modification of visor housing assembly and visor.

A clear visor assembly eyeshield is authorized by the Section H Allowance List, p. 4, item 19-1 and 19-2.

Chap Sticks and Oxygen

Tales continue to circulate that anti-chap sticks and oxygen usage are incompatible — that there is danger of fire and burned faces and burned lungs. The commanding officer of the School of Aviation Medicine, Pensacola, Fla., recently stated in answer to a letter of inquiry from a squadron flight surgeon: "There is no danger whatsoever . . . Our physiology department states categorically that there is no danger from the use of lip pomades of any type now in use. . . . We know of no cases of 'burned faces' and 'burned lungs' resulting from the combination of oxygen and cosmetics of any kind. . . . We know of no contraindication to the use of lip pomades with 100% oxygen."

Fire Protection

As a result of a very high sink rate before touchdown, the nosegear of the jet collapsed, puncturing the main fuselage fuel cell. Fire broke out. The aircraft slid up and off the runway finally coming to a stop. Here is part of the pilot's narrative:

Almost simultaneously with the abrupt stop of the aircraft I saw flames coming up the right side. To avoid these I went head first out the left side of the cockpit; however, I was apparently enveloped in flames. My clothing was on fire and I could feel my hands burning. My parachute was striking the backs of my legs and hampered any attempt to get up so I rolled away from the aircraft. The rolling seemed to stop much of the burning.

I had my oxygen mask on and face shield and seemed to have no difficulty in breathing. However, realizing I was on bailout oxygen which would be exhausted shortly and that I might pass out from shock, I took my mask and helmet off so I wouldn't suffocate in case I did pass out. About this time someone arrived and assisted me in getting out of my torso harness. Shortly thereafter the ambulance arrived and I was taken to the dispensary.

I feel I owe my present well-being to the fact that I was wearing all the required flight gear plus a few extras. I'm sure the long-sleeved marine green shirt I was wearing under my flight suit kept me from getting any severe burns about my arms and upper trunk. If I had been wearing a pair of long johns I might not have received such bad burns on the backs of my legs where the cutaway anti-G suit did not cover the area. My boots gave my feet and ankles excellent protection. The gloves gave me some protection in that my hands did not get charred. However, the heat caused the gloves to shrink and stick to my skin, making it too painful to allow removal of them at the scene of the crash.

Flight Surgeon's Comments: Careful utilization of all the required flight clothing and survival gear protected the pilot from potentially fatal burns. He was completely ensheathed in protective layers of material, literally from head to toe. Maintaining his oxygen mask and bailout bottle also is unquestionably responsible for protection from temperatures which unquestionably would have produced serious and perhaps fatal lung damage.

The protection afforded this aviator by standard flight gear serves as an excellent reminder to all aviators of the lifesaving qualities of the gear. The additional protection afforded his torso by the wool shirt worn under the flight suit demonstrates the value of further insulating layers where temperature conditions do not contraindicate. This protection would also be of value in the opposite sort of temperature extremes.

"Pow! Pow! Pow!"

The five tracers the survivor fired in the air were close enough to cause some concern and delay our moving over him in the water until we thought he was out of ammunition.

—Rescue Helo Pilot

"Grand Smoke"

I parachuted down into woods . . . The S-2 (S2F) kept flying overhead and changing prop pitch as he passed over me. So that he would not have too much of a problem keeping me in sight I built a pine straw fire and fed it with wet leaves. It made a grand smoke. *—Pilot in MOR* ●

"Engine Oils," appearing in the August 1963 issue, combined a reprint from the U. S. Army Aviation Digest and a BuWeps Instruction concerning detergent/dispersant type oils. While the Army is presently using straight mineral oils the Navy has made the transition. Here's a report on the Navy's experience with

Dispersant Engine Oils

By

HARRY R. LEWIS

Bureau of Naval Weapons

SHELL AVIATION NEWS

THE MODERN high-powered aircraft reciprocating engine is a very important form of propulsion in the US Navy. The high compression ratio and increased bearing loads expose lubricating oils to much higher local temperature stresses than have been previously experienced and power extraction has increased to a level at which one cubic inch piston displacement is now equal to one shaft horsepower. With the high horsepower/weight ratio and increased oil stressing, a need for a better lubricant became apparent. The military oil procured under Specification MIL-L-6082, Grades 1100 and 1065 could not provide the minimum oxidation and cleaning features necessary in the modern engine lubricating oil system. The hard and semi-hard deposits that accumulate on high temperature surfaces, dropped into the scavenge oil at various intervals, increasing the number of filter clogging incidents and bypassing solid and other contaminants into the highly loaded journal areas. Partial or total blockage of the many internal lubrication ports was observed during engine overhaul disassembly inspection. The desirability of additives became apparent but the so-called metallic additives available at this time created a problem when burned. The ash deposits resulted in valve and piston ring sticking, causing additional operating problems.

FIGURE 1: These pistons were removed from an R1820-86 engine with 366.0 hours since overhaul using 100 sec ashless dispersant oil. Note the lack of coke deposits in the ring lands and undercrown. The oil holes were clear of any blockage material.

Engine Failure Rate Causes Alarm

The US Navy became interested in the dispersant type of oil early in 1959 because of the alarming accident rate and the number of catastrophic engine failures in flight with the R1820-86 engine in the T-28 aircraft at the Naval Air Basic Training Command, Pensacola, Florida. The internal surfaces of engines that were recovered from accidents were found to be extremely dirty. Heavy, hard and semi-hard, coke and sludge accumulations were present throughout the engine lubricating system. The hard coke particles would collect on the filters and in most cases induce bypassing. A majority of engine failures were found to be caused from worn or seized master rod bearings.

A proprietary ashless dispersant 100 sec oil, undergoing commercial airline evaluation was procured for service test

in fifty-five T-28C aircraft. Preliminary test results of this product noted on TC18 commercial engines were very encouraging. The dispersant and oxidation stability features of this oil provided cleaner engine and airframe oil systems. The non-ash forming feature dispelled previous reservations on the use of additive oils.

The carrier version of the T-28 was selected for evaluation not only because of the high engine failure rate but also because of the severity of the training syllabus, which qualifies student pilots in the technique of carrier landings. Carrier qualification (for those unfamiliar with this type of flying) requires many periods of field landing practice by the student pilot followed by final qualification on an aircraft carrier. About 90% of the flying is accomplished at an altitude of 400 feet or below with wheels and flaps in a landing configuration. Considerable high power operation, with abrupt throttle 'chops' and bursts is necessary during a normal one-hour flight period. Usually the engine oil temperature remains at the maximum permissible limit, subjecting the oil to very severe oxidation conditions.

Shortly after changing over to the dispersant oil certain operating problems were reduced. The chronic, sluggish propeller governor discrepancy, prevalent with MIL-L-6082, viscosity oil reduced the oil consumption problem to an acceptable level. A subsequent piston ring configuration change initiated on all R1820-86 engines alleviated this problem.

High Rate of Engine Failure

The Atlantic Fleet in early 1959 experienced a high engine failure and premature removal rate in the Douglas AD-6 'Skyraider' attack bomber, powered by a single R3350-26W engine. Inspection of failed engines disclosed that heavy sludge and coking were present throughout the lubricating system. At the Fleet's request, eight carrier based AD-6 squadrons were selected to evaluate the dispersant oil. The assigned squadrons changed to the 100 sec ashless dispersant oil without segregating engines into groups, based on time on the 1100 Grade oil. The transition procedure required filter check and ground 'run-up' subsequent to the changeover, followed by draining. This procedure was adhered to by some squadrons, whereas others made the transition by adding the dispersant oil during normal aircraft servicing. A study of fleet operational experience conducted in November 1960 revealed the following improvements over Grade 1100 oil:

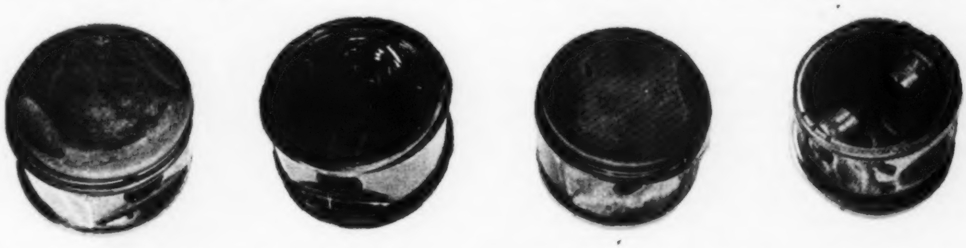


FIGURE 2 (LEFT): These pistons were removed from an R1820-86 engine that had accumulated 158.1 hours since overhaul with MIL-L-6082 Grade 1100. Compare these deposits with those in FIGURE 1 (page 34). FIGURE 3 (RIGHT): Pistons removed from an R1820-86 engine that had accumulated 839.4 hours since overhaul. The last 318.9 hours were on 100 sec ashless dispersant oil. Note the reduced amount of deposits in the ring lands and grooves. The oil holes were open.

Grade 1100 oil, and the flaky coke on the main oil inlet filter, usually present at the fifteen hour filter cleaning and inspection period, were greatly reduced.

Evidence of Gradual Cleaning

Other features of the oil were observed later during engine overhaul teardown. The internal surfaces on relatively low-time engines exposed to oil oxidizing temperatures were clean. Engines with the usual hard coke areas in the piston undercrown and in the compression ring and land areas showed evidence of gradual cleaning.

FIGURES 1 to 3, compare the operating time on oils and the deposit levels on pistons removed from R1820-86 engines.

In the summer of 1959, the Naval Air Basic Training Command encountered excessive oil consumption with these aircraft. This discrepancy was serious in view of the small quantity of oil carried in the T-28B/C aircraft. Investigation of the problem disclosed that the low viscosity 100 sec ashless dispersant oil was inadequate for the R1820-86 engine in view of the high ambient and engine operating oil temperatures. The viscosity would drop below that of Grade 1100 oil, reducing the wall oil film. The 100 sec dispersant oil was replaced with a 120 sec ashless dispersant oil. The higher

1. No sludge 'drop out' in the strainer after transition to dispersant oil.
2. Easier cold starting without the use of dilution or preheating.
3. Elimination of sluggish manifold absolute pressure regulators (oil strainers were clean).
4. Elimination of the oil temperature and pressure fluctuation.
5. Elimination of sticking oil pressure relief valves (this was a serious problem with Grade 1100 oil).
6. Reduction in the number of lower rocker box drain manifold clogging incidents and,
7. Elimination of erratic torque cell pressure readings.

The improved engine service life with this oil in the AD-6, in the Fleet, and the T-28C in the Training Command provided sufficient justification for a Navy-wide change. A new lubricating oil specification, MIL-L-22851(Wep), was prepared based on the 120 sec dispersant oil to supersede MIL-L-6082 Grade 1100 oil specification, and was issued for all reciprocating engine powered Naval aircraft. The major fleet commands shifted immediately to the dispersant oil. One hundred per cent Navy-wide changeover was attained in February, 1962.

The effect of oil dilution on engines with high time on Grade 1100 oil and now using the dispersant oil was of some

concern. The only previous oil dilution experience with dispersant oil had been obtained by the Royal Canadian Air Force on C-119 aircraft. However, during February, March and April of 1962, a P2V 'Neptune' squadron at the Naval Air Station (NAS), Brunswick, Maine, resorted to oil dilution of all aircraft. The engine time on dispersant oil prior to dilution was 200 hours minimum except on new or newly overhauled engines. Dilution was used 824 times on 26 engines. The oil filter condition was reported to be 'normal to cleaner than normal' on all category engines.

FIGURE 4 illustrates the coke free pistons removed from one of the oil-diluted, high-time R3350 engines.

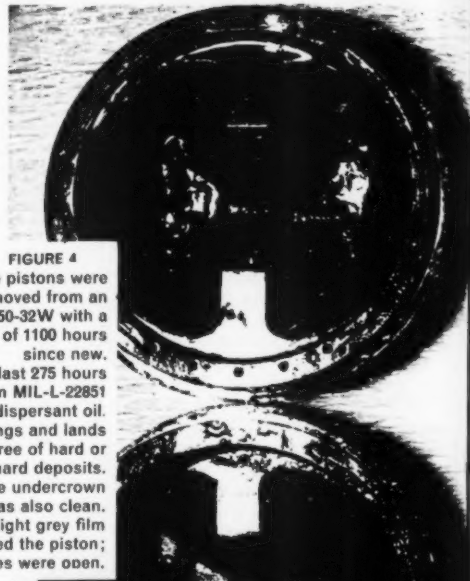


FIGURE 4
These pistons were removed from an R3350-32W with a total of 1100 hours since new. The last 275 hours were on MIL-L-22851 dispersant oil. The rings and lands were free of hard or semi-hard deposits. The undercrown was also clean. A light grey film covered the piston; all holes were open.

Improved Engine Life Reported

The Fleet Air Command at NAS Brunswick, Maine, reported in April, 1962, that the dispersant oil had assisted substantially in increasing engine time and reducing the premature-removal and inflight-failure rates on the P2V 'Neptune' aircraft. The Barrier Squadron Pacific, in the Hawaiian area, forwarded similar information on improved engine life noted with the Pacific Barrier Aircraft. The WV-2 and R7V-1 'Constellation' aircraft powered by R3350-34 turbo compound engines changed to a second source 120 sec dispersant oil in the summer of 1960.

FIGURE 5 is based on statistical data submitted by Fleet Air Hawaii. Note the improved engine TBO.

The results obtained to date have justified the use of dispersant oil but we have encountered several interesting engine and airframe problems that were attributed to the dispersant oil.

The first problem occurred this past winter. One S2F (Tracker) Squadron, attached to an anti-submarine carrier air group, operating in the Atlantic experienced a rash of premature engine removals due to incipient and inflight failures. The aircraft in this squadron completed the change-over to the dispersant oil in September 1961, prior to deployment. During this deployment period, considerable time was spent in port. Climatic conditions were damp and cool, ambient temperatures averaged about 35°F. Because of internal failures from oil 'run-off' previously encountered during prolonged periods of engine idleness, the US Navy requires engines that are idle for more than 72 hours to be pre-oiled before the next flight, or subjected to a ground

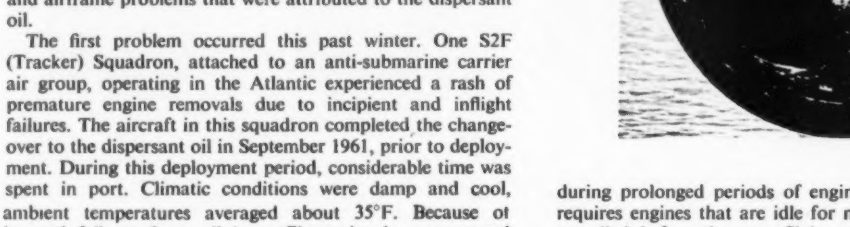


FIGURE 5 (LEFT): is based on statistical data submitted by Fleet Air Hawaii. Note the improved engine TBO.

turn-up. This squadron complied by regularly turning up engines during periods of reduced flight operations. Investigation of several failed engines, disclosed that a soft grey mobile sludge was present in the crankshaft crankpin sludge plug. Some of this material had entered the lubricating ports, restricting oil flow and eventually causing a master rod bearing failure. FIGURE 6 shows one of the sludge plugs.

After a thorough study of the sludge deposits, it was determined that moisture from engine turn-up and combustion blow-by did not evaporate because the oil temperature was not brought to the normal operating level and held for a sufficient period to eliminate the moisture. Maintenance personnel verified this by reporting later that engine turn-up was limited by flight deck availability. The two other squadrons on the same carrier did not experience such a problem. However, they were able to conduct longer engine run-up periods. Samples of oil drained from the aircraft were of a 'mayonnaise' consistency, which is indicative of water-in-dispersant-oil emulsion. Further investigation disclosed that the dispersant additive in the oil has an affinity for moisture and in its presence will drop out the finely suspended and dispersed materials into the oil system and absorb the moisture. The Royal Air Force encountered a similar problem several years ago under similar environmental conditions and overcame the problem by resorting to longer and higher oil temperatures during the engine turn-up. Instructions have been issued specifying a ground or flight deck turn-up of sufficient duration to permit the oil to stabilize at the specified operating temperature plus 10 minutes.

Release of Embedded Material

Another interesting incident traced to the use of dispersant oil in dirty engines and oil systems, was the release of entrained metal particles and flakes into the engine and airframe lubricating systems. The dispersant action of the oil, on the carbonaceous binders in the stagnant sludge areas of the oil coolers, oil tanks and engines with previous time on 1100 oil, released embedded material that circulated back into the oil system. The oil filters collected this material in sufficient quantities and size to warrant the operating units removing the engine as a precaution against a possible failure. A number of cases have been reported in which engines were removed for overhaul because of excessive metal flakes and particles adrift in the lubrication system but were found to have no discrepancies or evidence of internal wear.

FIGURE 7 is a cross section of an oil cooler removed from an S2F-1 with previous high time on Grade 1100 oil. The black surfaces are relatively hard and hold minute materials. Cleaning and flushing of oil coolers appears to be very unsatisfactory.

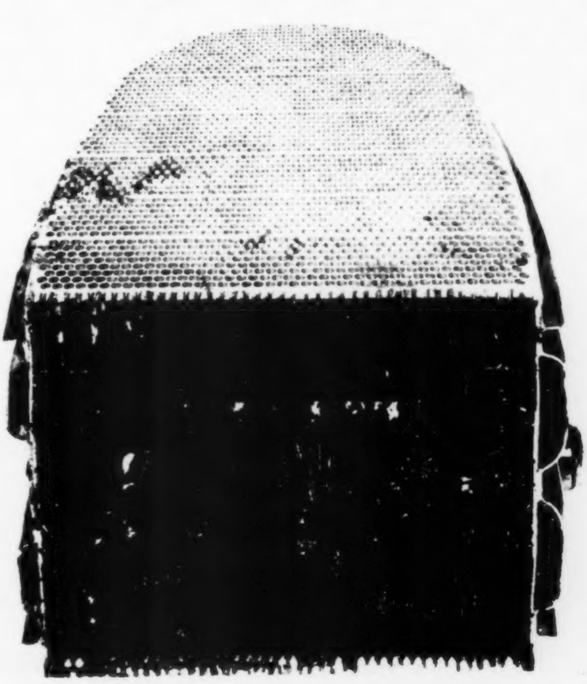
Eventually as engine time on the dispersant oil increases, oil systems will clean up and cease to release trapped metal flakes and other contaminants.

The dispersant oil has assisted materially in increasing engine time between overhaul on Navy reciprocating engines, and increased the oil change, flushing and desludging intervals for all oil-actuated accessories. Secondary benefits have also been gained in that less cleaning material and manpower are necessary during cleaning of engine overhaul parts.

In conclusion, the results that have been attained to date justify changing to the dispersant oil on all reciprocating engine powered aircraft. Water in any concentrated form may present a problem but by observing the minimum practices of good quality control, this problem can be eliminated.

FIGURE 6 (ABOVE): A crankpin sludge plug removed from the crankshaft of an R1820-82W engine, that had experienced a master rod bearing failure. Note the soft grey mobile sludge.

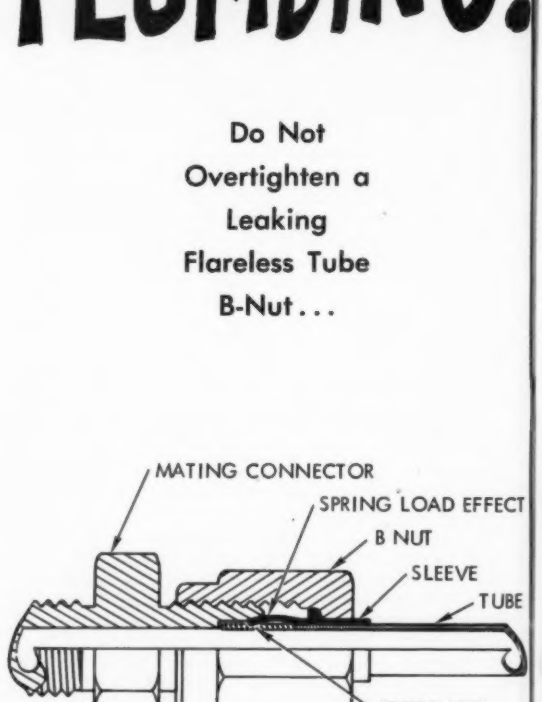
FIGURE 7 (BELOW): This cross-sectioned oil cooler was removed from an S2F-1 'Tracker' aircraft. Note the semi-hard flaky type coke with various amounts of embedded contamination. The gradual cleaning action of the dispersant oil releases such material back into the airframe and engine oil system.



PLANE PLUMBING.

Do Not Overtighten a Leaking Flareless Tube B-Nut . . .

Leaky plumbing in aircraft systems is the source of one of the greater trouble areas in aircraft maintenance. This trouble stems from poor workmanship and the lack of know-how. Here are a few tips on how to become a master of the problem.



FLARELESS TUBE CONNECTION
(installed and tightened)

When a B-nut on a hydraulic, pneumatic, pitot-static or instrument line is found to be leaking or is suspected of leaking, the natural tendency is to tighten it. This tendency is a carry-over from earlier aircraft on which flared tube connections were used.

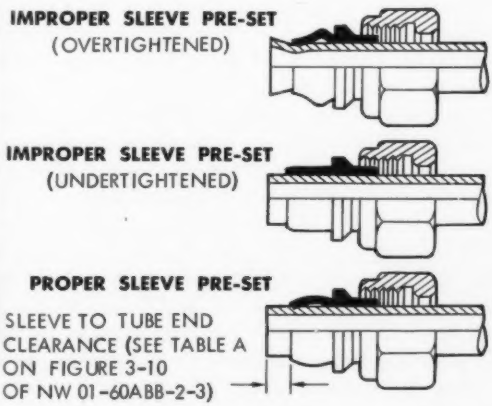
Many new aircraft use flareless tube connections and one of the easiest ways to damage the connection is to overtighten the B-nut to stop a leak. Flareless tube connections consist of a sleeve (MS21922) and B-nut (MS21921) installed on a straight end tube. The sleeve has a cutting edge which "bites" into the tube a predetermined amount during the assembly process. When the B-nut is tightened during installation, the sleeve is compressed and produces a spring load effect to seal against leakage and lock the B-nut in place. The B-nut must be tightened a specified amount ($\frac{1}{6}$ to $\frac{1}{3}$ turn from point where sharp rise in torque is felt during tightening); however, there is no specific torque setting for flareless tube B-nuts and torque wrenches are not to be used. Overtightening a flareless tube B-nut does nothing more than drive the cutting edge of the sleeve deeper into the tube, weakening the tube to the point where normal inflight vibration could cause the tube to shear.

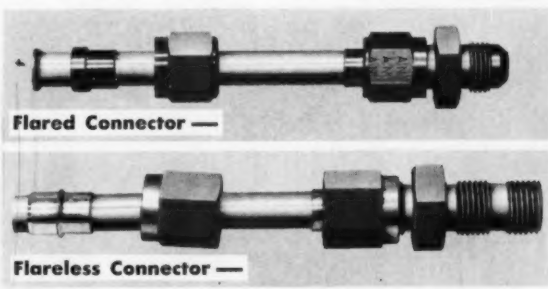
Defective flareless tube connections found on aircraft undergoing modernization indicate that technicians have been overtightening the B-nuts quite frequently. In some cases, the tube ends are gouged deeply while others have been found with the tube end sheared completely through. The condition is most prevalent in the smaller $\frac{3}{16}$ to $\frac{3}{8}$ inch diameter tubes.

To correct a leaking flareless tube connection: Retighten the B-nut as follows:

- ►Dump system pressure (if applicable).
- ►Back off the B-nut one or two turns.
- ►Using a wrench, tighten the B-nut until a sharp rise in torque is felt.
- ►Tighten the nut an additional $\frac{1}{6}$ to $\frac{1}{3}$ turn. Do not exceed $\frac{1}{3}$ turn.
- ►Pressurize the system (if applicable) and check connection. If leakage still persists, disconnect B-nut and inspect for following.
    - Inspect tube end for deep gouges, cracks, flaring, or sheared condition.
    - Check sleeve for proper preset.
    - Check sleeve to tube clearance.
    - Check for scratches or nicks on tube end sealing surfaces.
    - Check inside of mating fitting for damage.

Any of these items could cause leakage at the connection. Refer to the appropriate aircraft maintenance instructions manual for corrective action.





Flareless tube fittings can generally be identified by color. Flareless tube fittings are usually light gold in color while flared tube fittings are usually blue.

Clamp Spraybar to Its Own Manifold

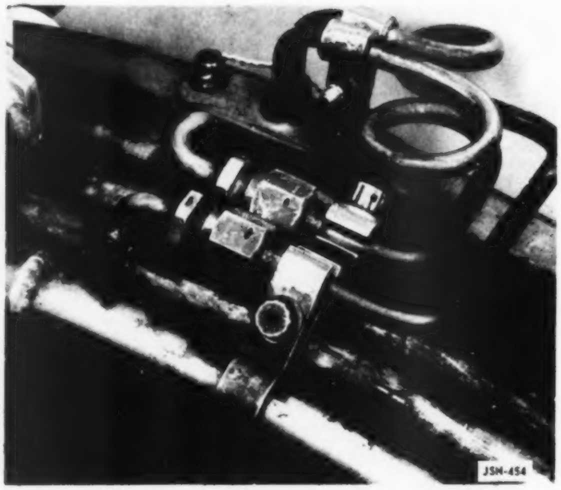


Figure 1

Figure 2

Spraybars on J79 engines are still being incorrectly clamped and pigtails are still snapping in two as a result. This can make for a touchy situation if it happens in flight and the afterburner system is put into operation.

A casual glance at the clamping arrangement may not readily reveal the important relationship of clamps and supports. However, there is a great deal of importance attached to the correct pattern.

Figure 1 shows an example of improper clamping. The clamps have been placed between the spraybar tubes and the adjacent fuel manifolds.

Chances are good that a spraybar and its manifold will vibrate out of phase or at a different amplitude and frequency from other manifolds and spraybars.

A spraybar clamped to a manifold other than that to which it is connected may zig while the manifold zags. This may cause the tube to flex continuously during engine operation. Eventually it may get tired enough to snap.

The solution is to keep the zigs and zags together and figure 2 shows how. Always clamp each spraybar tube to the manifold to which it is connected. Then they will vibrate in phase with each other.

For this reason there are clamps of two different lengths. Note in figure 2 that the longer one is used whenever the spraybar tube crosses over and runs parallel with an adjacent manifold. The short one is used when a tube runs parallel with its own manifold.

Be certain that the clamps do not extend over any part of the curved section of a spraybar tube and that there is no contact between the edge of the clamp and the coupling nut ferrule. The clearance between the clamp and the coupling nut ferrule should not exceed 0.030 inch. The clamps should have no sharp edges.

Correct spraybar clamping is necessary to eliminate possibilities of pre-stressing and weakening spraybar tubes. Careful handling of the components is also a must. Tube failure can be invited by bending manifolds during installation, removal, or storage; or by malpositioning the parts in relation to each of the others in the assembly, and then forcing the tubes into place to make the final connections.

Always use the step-by-step procedures in the applicable technical publications when performing these assembly operations. Much depends upon a complete accurate job in this area.—*GE Jet Service News*

A Chronic Squawk

Troubleshooting capabilities vary from squadron to squadron in the Navy. To show that we aren't the only ones having such troubles, here's a note borrowed from an airline maintenance report.

Until very recently we had an *Electra* limping around the system with a chronic squawk. The bone of contention in this case seemed to be the First Officer's navigational receiver.

The first complaint in the log book stated that the First Officer's Course Deviation Indicator drifted back and forth, the to-from triangle was jittery, and that the warning flag showed occasionally on VOR. OK on LOC. In answer to this squawk the 51R receiver and the course deviation indicator were changed.

A week or so later the receiver was again swapped as a result of a similar lament.

All this changing of components seemed to do no good, for the same complaint was registered in the book just a few days later!

This time, however, our airplane fell into good hands, and the sequence of events was altered considerably. An alert troubleshooting team checked out the receiver, found it to be in perfect shape, then went on to make a functional check of the NAV flag circuit. They found two wires open. Close scrutiny of the lugs on terminals disclosed clearly just why this circuit was sick.

Both of these Amphenol pre-insulated terminals had apparently been installed (or more correctly, smashed) on the wires with Stak-on pliers. It was bad enough that the wrong equipment was used, but what's worse, these wires were stripped, then shoved too far into the terminal and crimped completely over the insulation! The stripped bare wire protruded past the crimped area and probably made in-

termittent contact while the airplane was running. With everything shut down, the circuit, as we have said, was open.

For curiosity's sake, a check through the log book back into ancient times revealed no entry stating when and if these terminals had been installed by our personnel.

We have here a saga with a very unhappy beginning, because the poorest type of work was applied. The middle chapters were equally bleak, in that poor or no troubleshooting techniques were used. Our faith in human nature was restored, however, by the ending. The situation was alertly and intelligently appraised; prompt and correct mechanical surgery was applied to a chronic ailment, and the patient made an instantaneous recovery. Once again, or maybe for the first time, our Electra had a top-notch working system.

Hats off to mechanics like this! Like greenbacks at bill paying time, there should be more.

One more thing. Log books are full of chronic squawks, most of them generated because of lousy troubleshooting. Shape up in that department, and this airplane fixing business will have gone a long way.

Electronic Troubleshooting Guide

If a pilot hasn't been checked out on use of electronic gear, he will report it "out of commission" and a work-order will be issued. Upon receipt of the work-order, pick up a tool box and proceed to aircraft.

Upon reaching aircraft carry out following steps in order. (If you're lucky, "gripe" might be corrected before completing entire sequence. If so, proceed to Maintenance Office and write "Ground checks 4.0 on work-order":

Reach into tool box and pick up a small hammer. Beat a black box in aircraft rapidly along the top and sides.

Exchange small hammer for large hammer. Gently mash black box *one* time.

Remove black box from aircraft and carefully drop on deck from height of 4'-31/4" (± .0023").

If trouble persists, you must draw a new black box from the big black box locker.

Note: Before drawing a new black box you must fill out a FUR report on why old black box doesn't work. On part of form marked Part Condition simply check *Out Of Tolerance* and on part marked Cause

of Trouble check *Design Deficiency*.

Install new black box in aircraft.

If trouble persists you have selected wrong black box. You must now open red book marked HMI. (Found under Avionics Officer's desk to keep his feet off cold concrete or steel deck.)

Note: As you look into red book be sure to break out slide rule and talk loudly of electronics. Use such words as impedance, capacitive reactance, magnetron and other big words you may find in bold print in the HMI. This form of efficient maintenance always impresses non-electronic personnel.

Find a page with black lines going every which way. Follow line marked "A" with finger until you reach a square which indicates a black box.

Go to aircraft and find this black box. (If you cannot find it get nearest black box as your finger probably slipped in red book.)

If trouble persists continue above process until you come to a black box the big black box locker does not have. You can now go AOCP and, if you're lucky, some one else will repair aircraft when new box arrives.—*LTJG G. F. Heffernan VA-22 Avionics Officer*

Wheel Bearing Grease

Wheel bearings of many of our aircraft are now being packed with Mil-G-25760A grease rather than Mil-G-3545. The change was made primarily because of the thermal range differences of these greases. Mil-G-25760A ranges from –65°F to 350°F while Mil-G-3545 ranges from –20°F to about 300°F.

Mil-G-25760A grease is basically a diester fluid (a synthetic based on organic acid) plus a filler of

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eve

organic material such as aryl urea, which is thermally stable to 600°F plus. Also, Mil-G-25760A contains a rust inhibitor additive. Mil-G-25760A greases are blue, and known informally as "blue grease". However, in the future, some greases may be produced which conform to the Mil-G-25760A specification but are not blue. Thus the color should not be considered a positive identification of a particular grease. Mil-G-25760A greases are incompatible with many other compounds such as paints, plastics, rubber, and especially with other greases having a petroleum base.

Being so incompatible, how can this Mil-G-25760A grease be used in wheel bearings? In the F4B grease is retained in the bearing by a seal made of a synthetic rubber (Polyacrylate) which is completely compatible with the Mil-G-25760A grease. On the other hand this grease is not completely compatible with the lacquer paint on the wheel and doors and care should be taken not to smear any of it on painted areas while repacking the wheel bearings. If the Mil-G-25760A grease does come into contact with lacquer, the paint becomes soft and is absorbed by the grease. However, with the rust inhibitor additive in the grease, corrosive protection of the metal is still maintained.

Mil-G-25760A is not compatible with other greases with a petroleum base, and in no case should be used with them. Therefore, when a wheel packed with Mil-G-3545 is to be repacked with Mil-G-25760A the old grease must be completely cleaned out. According to BuWeps Inst. 10350.2 of November 1961 it is required that the old grease will be cleaned out as follows:

1. Washing bearing thoroughly in Stoddard Solvent.
2. Rinse bearing in isopropyl alcohol.
3. Dry thoroughly to remove cleaning solvents.

Don't rely on color identifications. If you are in doubt as to the exact type of the old grease in the bearing, clean it out.—*McDonnell "Support"*

R1820 Engine Pre-Oiling

BuWeps has advised that the RIC, Wood-Ridge had recommended the deletion of the requirement for pre-oil after an oil change, provided the oil pump and oil inlet line to the engine are properly purged of air. BuWeps concurs with this

Fur Reports

THE Naval Air Technical Services Facility was recently advised of a situation where 209 malfunctions occurred but only 20 FUR reports were prepared. It was determined that the reporting activity was only submitting a FUR when the item of supply was accountable.

The requirement for submitting a FUR in order to draw or exchange a replacement item is an effective method of insuring receipt of material failure reports on these items. However, it should be noted that the FUR is primarily a *failure* report; not a supply document. The effectiveness of the Malfunction Reporting Program becomes limited when discrepancies on non-exchangeable items are not reported.

Activities are advised that the FUR report shall be used to report failures on unsatisfactory conditions of all materials described in BuWeps Inst. 4700.2. Electronic material will also be reported by a FUR whenever it becomes necessary to return to supply an accountable item (MARTC coded D, E, R, or L).

A FUR set will be made out whenever:

- A replacement part is requested for an R, D, E, or L accountability coded item.
- An item is delivered to a supporting maintenance activity for repair.

Note. An additional single sheet FUR shall be prepared and retained by the reporting activity for record purposes.

The single sheet FUR is to be used whenever:

- An R, D, E. or L coded item is found to be unsatisfactory, but replacement is not required.
- Discrepancies for failures are reported by a government inspection activity on new materials received for installation.
- A faulty item is repaired and reused without the necessity for requisitioning a like replacement item.
- Equipment requires excessive adjustment or maintenance in service.

recommendation and has requested that all applicable R1820 Engine Manuals be revised to delete the requirement for pre-oil after an oil drain or other operation which permits air to enter the oil inlet line.

Action has been taken to have the following note and cautions inserted in the pre-oil instructions:

Note: After an oil change or any other operation which would permit air to enter the oil inlet line from the supply tank to the pressure pump, it is only necessary to evacuate air from the oil inlet line and oil pump. Remove the inlet check valve (pre-oil plug on-84/-90 engines) from the left side of the rear oil pump housing, and motor the engine over until a minimum of one pint of air free oil is expelled from the port. Replace the inlet check valve or pre-oil plug.

Caution: Install the check valve or pre-oil plug as quickly as possible to preclude admission of air to the engine lubricating system.

Caution: Failure to bleed this air from the oil inlet line can result in an air lock in the inlet line with the resultant lack of oil pressure.

Chopper Salvage at Sea

ENGINE power loss during an antisubmarine exercise by an SH-3A (HSS-2) caused a forced landing in the sea 8 to 10 miles from its carrier. After remaining afloat for 2 to 3 minutes the top-heavy chopper capsized. Its crew abandoned the plane, took to life rafts and were later rescued.

Upon coming along side the ship attempted salvage efforts for some two hours while the chopper remained near the surface buoyed by its sponsons. A bridle attached to the port and starboard sponsons was then hooked to the ship's crane. Upon lifting the inverted water-filled hull the sponsons were torn off the airframe. Necessary flotation was lost and the aircraft sank in 2050 fathoms of water. Excessive rolling of the ship, causing high rates off ascent and descent of the crane made it impossible to raise the aircraft slowly and allow the water to drain.

Sponsons were shorn during lift attempt.

In the opinion of the accident board, salvage might have been successful in a calm sea provided certain techniques had been perfected. Insertion of liferafts or inflatable cells inside the helicopter and inflating them would assure flotation. A diver could then attach a harness to the rotor head. It is believed the aircraft could be retrieved in this fashion.

Recommendations by the board include that a study be made to determine the best procedure for recovery of this model aircraft in the open sea and that a pre-salvage plan be developed and published.

Reliability Conference

The Seventh Navy-industry Conference on Material Reliability will be held on 16 and 17 October 1963, at the Mayflower Hotel, Washington, D. C. The program plans include DOD, CNO, and BuWeps presentations on new systems effectiveness. A report of actions on all the recommendations made at last year's conference also will be given.

The Director of Defense Research and Engineering, Dr. Harold Brown, has issued a policy statement placing stronger management emphasis on reliability achievement. Three specific actions are indicated as the immediate necessity.

The first of these is the statement of quantitative reliability goals and the demonstration of their achievement in development programs.

The second is the development of timely reliability status information on major programs for each system and its major subsystems, the approved reliability requirements, the contracted goals, the predicted and time-measured results.

The third action is management level reliability training, including a knowledge of reliability techniques and methodolgy.

CNO has established a committee under the chairmanship of Captain John C. Allman, (OP-701D) to review the achievement of reliability in major Navy programs.

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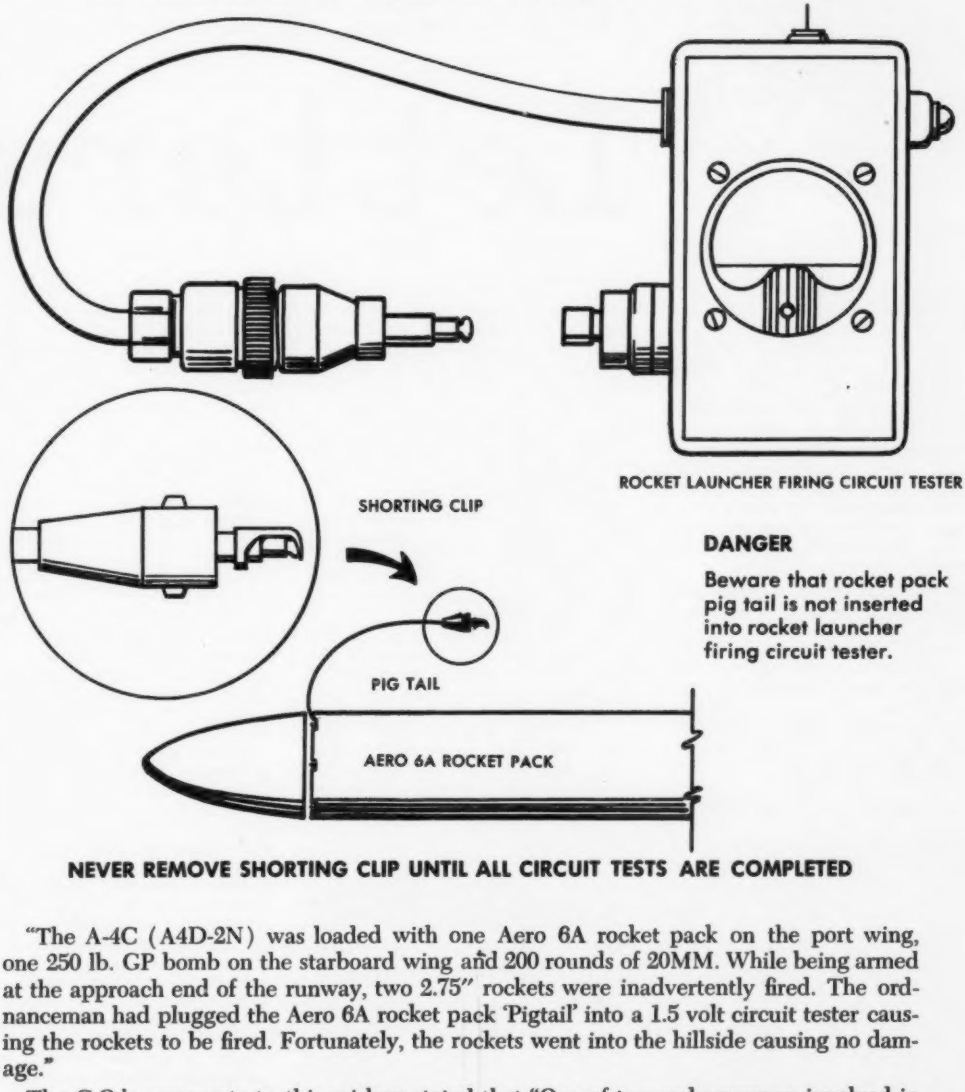
MURPHY'S LAW*

* If an aircraft part can be installed incorrectly, someone will install it that way!



NEVER REMOVE SHORTING CLIP UNTIL ALL CIRCUIT TESTS ARE COMPLETED

"The A-4C (A4D-2N) was loaded with one Aero 6A rocket pack on the port wing, one 250 lb. GP bomb on the starboard wing and 200 rounds of 20MM. While being armed at the approach end of the runway, two 2.75" rockets were inadvertently fired. The ordnanceman had plugged the Aero 6A rocket pack 'Pigtail' into a 1.5 volt circuit tester causing the rockets to be fired. Fortunately, the rockets went into the hillside causing no damage."

The C.O.'s comments to this mishap stated that "One of two ordnancemen involved in this incident was briefed on the arming procedure of the Aero 6A Rocket Pack. The other ordnanceman was unfamiliar with the arming procedure of this particular type rocket pack. The briefed ordnanceman was apparently uncertain of himself as he handed the tester to the other ordnanceman thinking he knew more about the arming procedure. The unbriefed ordnanceman was entirely unfamiliar with the arming procedures and plugged the 'Pigtail' of the rocket pack into the 1.5 volt tester causing the rocket to fire." ●

Want your safety suggestion read by nearly a quarter of a million people in naval aviation? Send your constructive suggestions to APPROACH.

Letters

Night Fright

Syracuse, N. Y.—"Night Fright" in the June issue surely deserves the attention of carrier operational commanders and commanding officers. With over two years of recent CVA squadron experience, I would like to second the motion and emphasize several points made.

Confidence is essential and must be cultivated with equal emphasis as procedures. A breakdown of confidence of either pilots or controller is a danger signal to which supervisors must be immediately sensitive and responsive.

Scheduling non-current pilots, regardless of experience, for "bad night" operations defies logic yet it is done. The point has been argued many times in recent months whether the average pilot can be expected to perform safely on a black night without first having had day flights within the previous 2 or 3 day period. I am convinced he cannot perform safely with acceptable consistency.

Standardized CCA procedures on a particular ship are essential for understanding and confidence of the entire team. All changes to procedures should be promulgated under the the signature of the CO or his designated representative. A CCA manual (bible) that is current to the day must be available to all pilots, controllers, and supervisors. Interim verbal and/or memoradum changes are asking for trouble.

Equipment limitations must be recognized, operational considerations notwithstanding. Frantic attempts to handle more planes in less time have most often confused the situation, degraded safety and extended recovery time – not reduced it.

CCA demands the most precise performance of each member of the team. In most centers more careful attention to organizational and procedural detail can eliminate many of the seemingly insurmountable problems. It's the accumulative little things that tend to confuse the big picture. Detailed standardization between ships is not essential or desirable—each has the limitations of its own equipment, personnel, and aircraft to consider in the development of SOP. It must be recognized that even with present equipment, CCA can be significantly improved and that the inevitable melee is not inevitable. Most significantly the simple fact that a confident "set up" pilot will probably get aboard the first pass is often overlooked—that is the most positive way to reduce recovery time.

GERALD F. BRUMMITT, LCDR
Box 33, Hancock Field

British Life Jacket

NARTU, Alameda—Much has been written recently regarding possible solutions towards providing a suitable life preserver for flight deck and squadron personnel. Although there is a prototype model of a life belt in the mill, it is my opinion that this will have some serious shortcomings. To clarify this, I refer to an article in the *Weekly Summary*, 18-24 March 63. The key to the problem is in the following quote, "It can be argued that some of these items are not entirely satisfactory; that the life jacket's successful employment requires a man to be *conscious* after entering the water. This is true, but consider; if the use of this equipment saves only one man out of two, it is well worth using until better is available."

The significance of these statements lies in the necessity for "manual inflation" of the life jacket. I am suggesting that there is and has been an inflatable life jacket in use for several years that would solve this problem nicely. It is the "water immersion activated life jacket" utilized by the flight crews of the Royal Air Force. Activation is accomplished by a single large cartridge which is safetied when not in use by a safety pin similar to other devices that require a pin to

prevent inadvertent activation. This pin is removed by the pilot or crewman prior to a launch as SOP. The life jacket is considerably smaller and less bulky than our standard mae west. It is worn high on the chest and is designed to hold the head up and out of the water. By the life jacket automatically inflating upon entering the water, the crewman has a chance for survival in case of injury or unconsciousness.

I believe that a life jacket of this type could be scrounged from our British friends for tests and evaluation. They might have something—after all, they came up with a few items such as the steam catapult, angle deck, and Martin-Baker seat, to mention a few. Any comments on this idea will be greatly appreciated.

R. J. MANICKI ADJC

P. S. I first became aware of this British mae west from a friend of mine who was issued a new "surplus" one by his company for safety. His job? A rigger working on a dock over water. Case rests.

Below Par

NAS—At the time of flight planning and filing, for our night hop, thunderstorms were forecast in the destination area northward — isolated/scattered, etc. Weather placed on the DD175 was high scattered and 7 miles.

Since thunderstorms were seen along the coast and inland throughout the flight, we were naturally concerned for terminal weather. Prior to reaching our last reporting point we switched to approach control for the current weather and status on thunderstorms. Approach control was coming in very weak and completely unreadable due to broken transmissions. After several minutes of attempting to obtain weather information, we returned to center frequency for a position report. After the position report we switched back to approach control frequency with no avail, thence to the destination tower for current weather. We were given a sequence report reading of high scattered and 7 mi. visibility. We requested current weather again from aerology, were given a STANDBY, and finally forecaster weather; high scattered and 7.

We returned to center frequency, were given clearance to destination fix and descents to 20,000 feet. I switched to approach control, was given altimeter setting, no delay on approach, radar frequency, and the same weather; high scattered and five. I commenced approach and switched to the assigned GCA frequency and was given instructions to level off at 1500 feet. The duty runway was given as 14R. No weather was given of any consequence until on tight cross-leg turn to final heading; *high scattered and ½ in fog*. Since no ceiling was given, we continued the PAR approach. However, just as we began the missed approach procedure at minimums, we sighted the runways — for we were lined up exactly centered between runways 14L and 14R.

The GCA headings given us were as follows: from cross-leg to 140 — stop turn at 130 — reported steady 130 — was given left turn to 125 — intercepting glide slope, on glide slope heading 105????. I didn't turn to that heading but rather chose to hold 120 instead, since I was double checking navigation by tacan. Within seconds of approaching the 200 ft. point on the glide slope we were given a turn to 140. By this time we were slightly below glide slope — corrected back on to the slope and were told that we were approaching minimums. Weather was estimated by us to be no more than 100 and ¾. We questioned fire/crash personnel, who arrived very shortly after we engaged the abort gear, as to how long the fog had been present at the field. No answer was less than thirty minutes and one was as long as two to three hours!

The following facts of this field's RATTC/Aerology Departments are considered unsatisfactory in this incident:

1. Sequence weather given when thunderstorms were in and forecast for the area.
2. No warning of fog until on final GCA and still no ceiling designation.
3. Improper GCA heading control on runway 14R.
4. No high intensity lights were made available when the field went under fog, and especially at night.
5. Approach was directed to runway 14R which has no mirror and is not an all-weather runway.

ANYMOUSE

● We certainly hope you had a long chat with the people concerned with this performance.

Operation Free Loader

Red warning lights will be added to federal power lines in the western U. S. "Operation Free Loader," a joint FAA/Bureau of Reclamation project, will hang the lights on wires between support towers—especially over stream beds and canyons where wires pose a hazard to low-flying aircraft. Lights are induction-powered from the transmission line itself.—*American Aviation.*

Correction Notice

Due to a typographical error, the following formula was omitted from "Cautious Tigers," column two, page 10, of the September issue:

$$V_{s\alpha} = V_s\sqrt{\frac{1}{\cos\alpha}}$$

'Wash or Pit'

Jacksonville, N. C.—I would like to obtain 100 copies of "Wash or Pit" including photos from the May 1963 APPROACH.

Marine Medium Helicopter Squadron 265 will be the first Marine Corps Squadron to receive aircraft using the T-58-8 engine.

I am sure "Wash or Pit" will be very useful in our training program.

GERALD F. DOOLEY,
1ST LT, USMC
QUALITY CONTROL OFFICER

● Reprints of the article have been forwarded. Additional copies are still available.

Interim Revisions, Beech

Washington—In your July 1963 article entitled "When Strong Winds Blow," the author states there are no limitations on crosswind operations in either the Flight Manual or NATOPS Manual offered for the *Beech*. On 31 August 1962, Flight Handbook Interim Revision No. 5 for the SNB was published providing both crosswind landing and takeoff information, including recommended techniques and charts.

Here in the Washington area where there are approximately 1200 proficiency pilots, most of them flying the *Beech*, this information has received wide dissemination. However, in other areas it may not have, and it should be stressed that a constant revue of the handbook, and *all Interim Revisions* is a must to stay proficient in any aircraft, regardless of flight hours in model.

R. F. AUSTIN, LT
U. S. Naval Air Facility

● We goofed. Interim revisions, 1, 2, 3 and 4 in one handbook, 5 and 6 in the other. You can guess which one we referenced. ●

NavWeps 00-75-510

approach

Vol. 9 No. 4

Purposes and policies: *Approach*, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Official Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting *Approach* material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS Norfolk 11, Va. Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contract status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington 25, D. C. **Subscriptions:** Single copy 35 cents; 1-year subscriptions \$3.50; 2 yrs., \$7.00; 3 yrs., \$10.50; \$1.00 additional annually for foreign mailing. **Printing:** Issuance of this publication approved by the Secretary of the Navy on 15 April 1961. Library of Congress Catalog No. 57—60020.

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Flight Operations

Aero-Medical

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Departments

Our product is safety, our process is education, and our profit is measured in the preservation of lives and equipment and increased mission readiness.

CNO AWARD WINNERS

Winners

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VA-12	VF-931	VR-21
VAH-7	VA-876	VA-52
CVG-6	VP-776	VF-121
VS-39	VS-662	VS-41
HS-3	VR-743	VP-4
VAW-33	HS-772	VMF-232
CVSG-58	VMF-511	VMA-214
HMM-263	VMA-141	VT-23
H&MS-32	VMR-234	VT-29
VMCJ-2	HMM-768	VT-9
	AEWBarRonPac	

Runners-Up

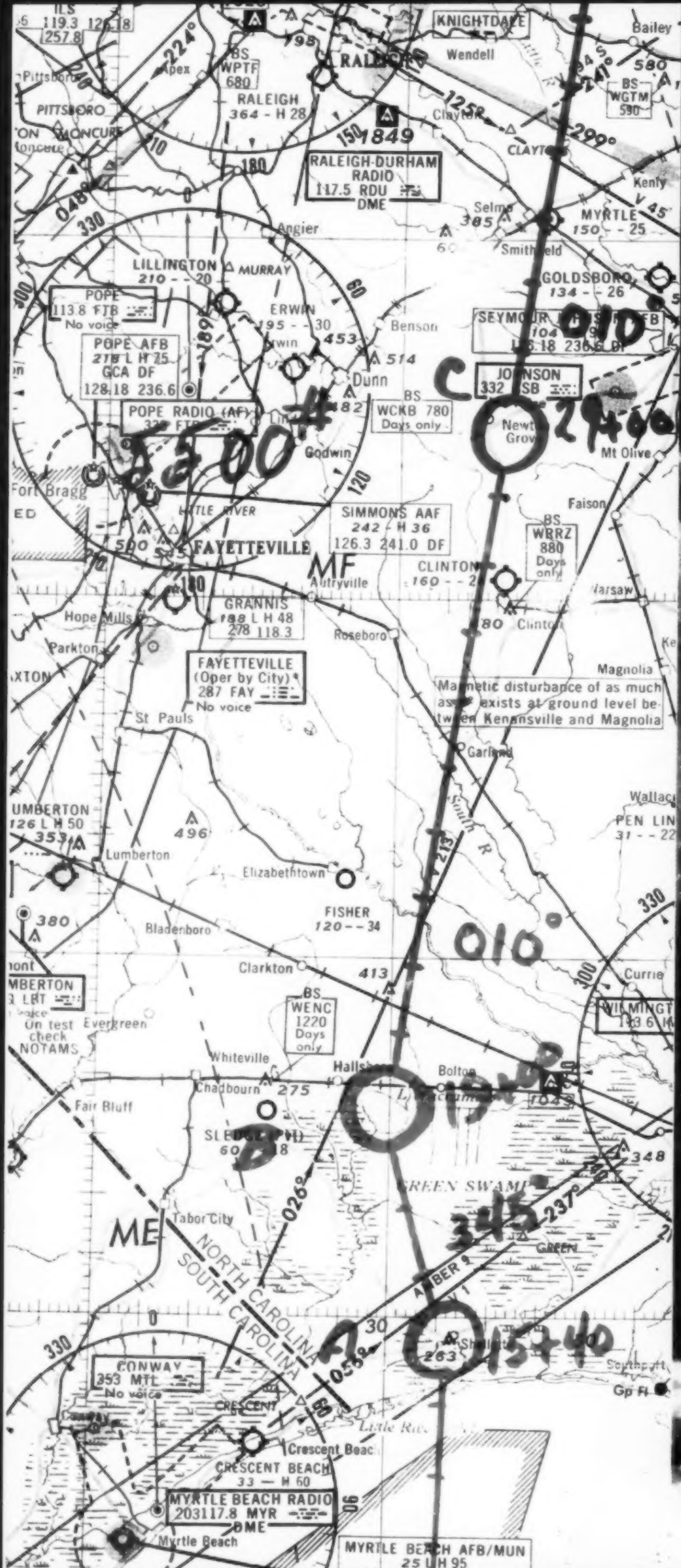
VF-41	VF-101	VMGR-252
VF-154	VS-30	VMGR-152
VMF(AW)-122	CVG-11	VW-11
VA-146	CVSG-57	HS-8
VMA-332	VP-23	HMM-364
VA-176	VS-35	H&MS-33
VAH-2	VR-24	VAW-13
	VMCJ-1	

Special Awards

USS LEXINGTON   USS PRINCETON

Flatley Awards

CVA	CVS
USS ORISKANY	USS RANDOLPH



KNIGHTDALE
Wendell
Bailey
RALEIGH
364 - H 28
BS WPTF 680
BS WGTM 590
Apex
Pittsboro
PITTSBORO
MONCURE
1849
Clayton
CLAYTON
RALEIGH-DURHAM RADIO
117.5 RDU
DME
Kenly
Selma
385
MYRTLE
150 - - 25
Smithfield
Angier
LILLINGTON
210 - - 20
MURRAY
POPE
113.8 FTB
No voice
ERWIN
195 - - 30
453
Benson
POPE AFB
GCA DF
128.18 236.6
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Dunn
GOLDSBORO
134 - - 26
SEYMOUR JOHNSON AFB
010
JOHNSON
332 SB
C
POPE RADIO (AF)
BS WCKB 780
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5500
Godwin
Newton Grove
2400
Mt Olive
Fort Bragg
Faison
SIMMONS AAF
242 - H 36
126.3 241.0 DF
BS WRRZ 880 Days only
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CLINTON
Autryville
GRANNIS
Hope Mills
Roseboro
Clinton
Parkton
Warsaw
FAYETTEVILLE (Oper by City)
287 FAY
No voice
Magnolia
Magnetic disturbance of as much as exists at ground level between Kenansville and Magnolia
St Pauls
Garland
LUMBERTON
126 L H 50
Lumberton
496
Elizabethtown
FISHER
120 - - 34
Wallace
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380
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Evergreen
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Hallsboro
Bolton
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SLEDGE (PVT)
1940
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348
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NORTH CAROLINA
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Shallotte
CONWAY
353 MTL
No voice
CRESCENT
Crescent Beach
CRESCENT BEACH
33 — H 60
MYRTLE BEACH RADIO
203 117.8 MYR
DME
Myrtle Beach
MYRTLE BEACH AFB/MUN
25 L H 95
Southport